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ABSTRACT

Designed to explore the effectiveness of predictors of academic readiness among low SES ethnically diverse children, this study tested low income 4- and 5-year-old Anglo-American, Mexican, and Vietnamese children eligible for kindergarten in the school year 1982-83. The recently arrived Mexican and Vietnamese children did not speak English. Sixty children (20 from each ethnic group) were tested at home to determine the relationship of five independent variables (chronological age in months, general knowledge, intelligence, persistence, and gender of child), as measured by the Cooperative Preschool Inventory, the Columbia Mental Maturity Scale, and the Michigan State University Puzzle Box, to academic readiness as measured by the Metropolitan Readiness Test. All independent variables except age showed a significant relationship to academic readiness; this finding was interpreted to suggest that a myriad of factors influence academic readiness. Among the conclusions and implications of the study are the following: the lack of significant correlation for age in months and academic readiness may be influenced by the age range of study participants as well as by difficulties in assessing exact ages of ethnically diverse students, accurate assessment of non-English speaking students is necessary to avoid misclassification, and recent exposure to Western Society might affect performance of students from some ethnic groups. (BJD)

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# ENGLISH LANGUAGE INDEPENDENT PREDICTION OF ACADEMIC READINESS IN ETHNICALLY DIVERSE LOW SES FOUR AND FIVE YEAR OLD CHILDREN

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A Dissertation
Presented to
the Faculty of the Graduate School of Arts and Sciences
University of Denver

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In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

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by
Marjorie L. Milan
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THE GRADUATE SCHOOL OF ARTS AND SCIENCES

OF

THE UNIVERSITY OF DENVER

Upon the recommendation of the Director of the School of Education this dissertation is hereby accepted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

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# CHAPTER I

## BACKGROUND OF THE STUDY

Over the past decade the United States has experienced new waves of immigration. In 1978 alone, over 600,000 people immigrated to the United States mainly from Southeast Asia, Cuba, Haiti and other central American nations in political turmoil, and from Mexico wracked with economic turmoil. Urban areas, as well as suburbs and towns in the United States caught up in the bind of desegregation and busing, are being confronted with the arrival of new waves of immigrant families with their children. These children are enrolling in the public schools. This has led to teachers and administrators experiencing rapid and startling changes in the educational setting that have confused and confounded them.

In those integrated schools where new immigrant populations have swelled the enrollment, teachers have been confronted with working with three particularly diverse ethnic groups in growing numbers. These three groups are the lower socioeconomic Anglo population of the United States, newly arrived Mexicans from across the border and the Vietnamese of the "boat people" migration. As a result, United States teachers have experienced an influx of widely diverse non-English speaking pupils in their classrooms.

Now teachers are faced with the dilemma of how to provide the best possible educational environment when their pupils are speaking and thinking in diverse languages. Although prediction of academic readiness of these children could provide teachers with necessary information to help them attain the optimal achievement toward the fulfillment of their potentiality, English language proficiency generally differentiates non-English speaking (NES) from English speaking (ES) children on academic measures to the extent that erroneous evaluation of NES children could and probably does result. To help overcome this differentiation, English language independent measures would have led to a more reliable and efficient prediction of NES children's academic readiness. However, there were few, if any, English language independent measures available for teachers to use.

This study focuses on predictors of academic readiness in children of lower socioeconomic status from three ethnically diverse groups: Anglo, recently arrived Mexican, and Vietnamese children. This study explores the potentiality of English language independent variables on non-English speaking children's ability to perform on academic measures. Lower socioeconomic status English speaking children have been the focus of many studies and much research, but it is the recently arrived Mexican and Vietnamese children that are little known to educators.

## Three Diverse Ethnic Groups

New waves of immigrants from Mexico have been flowing into the United States for the past several years representing a different

Hispanic group of people than the general stereotype of the Mexican Americans often held by the mainstream society in the United States Southwest. Like the immigrants from Europe many decades ago, these Spanish speaking families are eager to succeed in their new country, urge their children to study hard and achieve in school and are deeply concerned about the academic achievement of their children. Although these new Mexican immigrants are usually working class people, limited in their professional or highly-skilled training, their desire to acquire the United States ethos of upward mobility is evident.

Vietnamese families, on the other hand, are not as numerous as some other of the "boat people" settlements found in the large United States cities, but they do represent a recognizable and unique group of students in the schools. Generally, high achievers and well behaved, docile students, teachers seem to enjoy teaching Vietnamese children, often remarking about their amazing artistic skills and proficiency in math. This wide range of ethnically diverse pupils in many of the schools have posed a serious problem for teachers, who are used to teaching a majority of English-speaking, Anglo pupils with some Blacks or Hispanic interspersed.

Anglo families who qualify for low income housing on the basis of income, based on the number living in the family, generally do live in low income housing projects. Unlike the Vietnamese and Mexican immigrants, these families appear to have given up hope of succeeding in society, and have usually accepted an attitude of hopelessness in coping with daily living; disorder is generally observed in most of the home environments. The lower socioeconomic class Anglo pupils pose a serious problem in learning environments, and teachers usually find it difficult to motivate them toward learning.

Hence, this study, focusing on these three groups, will attempt to fill a needed gap in educators' ability to predict academic readiness of ethnically diverse young children.

## Statement of the Problem

Serious concern has been raised that at an early age the misidentification of non-English speaking, ethnically diverse children as educationally delayed, will lead to their being undereducated on the basis of such improper categorization.

## Purpose of the Study

This exploratory study was designed to investigate the effectiveness of certain predictors of academic readiness to determine which of these predictors are most reliable for low SES ethnically diverse children in order to provide a guide to future, more precise, research and to explore ethnic differences in academic readiness. Use of ethnically diverse children's dominant languages for purposes of assessment was assumed to promote English language independent measurement, and lead to more reliable and efficient prediction of academic readiness in ethnically diverse children.

The purpose of this study was to:

1. identify an instrument or combination of instruments which would be predictors of academic readiness of 4 and 5 year old, lower socioeconomic status, ethnically diverse (Anglo, Mexican, and Vietnamese) children.

2. compare the results of the use of these instruments among three ethnically diverse groups of young children.

## Justification of the Study

This study was justified by four major conditions: (1) the expanding number of NES ethnically diverse students in United States classrooms, (2) the lack of prior research on the prediction of academic readiness for ethnically diverse children, (3) the crucial need for reliable, accurate assessment of NES ethnically diverse students on measures related to academic readiness at an early age, and (4) the need for studies of comparisons of ethnically diverse children from low socioeconomic levels.

### The Expanding Number of NES Ethnically Diverse Students in United States Classrooms

Dermy (1982) stated that the surge in NES children in United States classrooms in the last decade was due in great measure to the influx of Latin American immigration and to the influx of Southeast Asian refugees. A United States census (1976) stated that 10% of school age children are of non-English speaking background. This amounted to 5,032,000 children in United States schools in 1976. In the state of Colorado alone, the English Language Proficiency Act (ELPA) certified count (1981) showed 11,016 children to be of non-English language background.

## Lack of Prior Research on the Prediction of Academic Readiness for Ethnically Diverse Children

Some widely accepted predictors of academic readiness for English speaking children generally found in the literature are: (1) General Knowledge, referring to the role of environment, as described in the writings of Kamii et al. (1969), Lavatelli(1973), and Nimnicht et al. (1968); (2) Intelligence, referring to reasoning ability, as described in the writings of Gallimore et al. (1979), Lunemann (1974), and Weikert (1971); and (3) Persistence, referring to task persistence, as described in the writings of French (1948), Ryans (1938), and Stephenson (1974). Unfortunately, there is a lack of studies in which these predictors have been investigated for non-English speaking children of different heritages. If, in fact, test variable predictors differ for ethnically diverse groups, then revised criteria for predicting academic readiness may be recommended to avoid erroneous predictions.

## Crucial Need for Reliable, Accurate Measurement of NES Ethnically Diverse Children During the Early School Years

There is a lack of studies, other than those of Mexican American children, for groups of ethnically diverse children, where the language of test administration is in the child's ethlanguage (any language spoken other than English). Although educators interested in planning, implementing, and evaluating curriculum for ethnically diverse children generally agree that opportunities are probably optimal during the early years, there are few studies where prediction of their academic success is made at the beginning of the kindergarten school year.

As ethnically diverse NES students progress through the elementary schools, they become more proficient in the use of the English language. Nevertheless, for the most part, academic skills are primarily developed in the first few years of formal schooling. Therefore, efficient and reliable assessment should help teachers provide more appropriate instruction during the early elementary school years, so ethnically diverse students may be better prepared to achieve in a wide variety of situations. This is particularly important at an early age as few preconceptions about intellectual self concept in a school environment have developed at this point in time.

## Need for Studies Comparing Ethnically Diverse Children from Low SES Levels

Low socioeconomic level (see Definitions of Terms) is an important factor in the prediction of academic readiness. Early prediction of academic readiness, particularly among low SES children is of vital concern to educators as discussed in the writings of Deutsch et al. (1968), Bronfenbrenner (1973), and

Weikert et al. (1970). The earlier any problems are identified, the greater the opportunity for providing ethnically diverse children of low SES background with appropriate educational environments. Teachers who use data gathered with largely English speaking, advantaged children, may tend to misidentify those low SES children who can be successful in the mainstream society setting.

## Hypotheses of the Study

The hypotheses of this study were based on the propositions that to overcome differences on test scores due to English language proficiency, testing children in their dominant languages would increase the accuracy of measurement; that academic readiness for ethnically diverse children can be predicted from test scores secured early in the kindergarten year, and that the predictors or combination of predictors may vary among ethnically diverse groups. This study was designed to explore predictors of academic readiness in ethnically diverse children and to compare means of predictor and criterion test scores among ethnically diverse groups.

Based on these propositions, the following hypotheses were formulated to be investigated by statistical analysis of data collected. (Null hypotheses are stated in Chapter III.)

1. The Pearson correlations between each test predictor and the criterion variable (academic readiness) will be significant for each ethnically diverse group, yet the prediction formula will vary according to ethnic group membership.

2. The ethnically diverse groups tested will not differ significantly on any of the selected instruments when the instruments are rendered English language independent through use of an interpreter in the children's dominant languages.

Data analyses of these hypotheses were made:

1. To determine the relationship between academic readiness scores on the Metropolitan Reading Test (Level I) (MRT) and scores on the following predictors of academic success: Columbia Mental Maturity Scale (CMMS); Michigan State University Puzzle Box (MSU); and Cooperative Preschool Inventory (CPSI), for the ethnically diverse groups of Anglo, Mexican, and Vietnamese 4 and 5 year old low SES children.

2. To determine, by multiple correlation, the combination of these predictors which best predict academic readiness as measured by the Metropolitan Readiness Test (MRT) (Level I) for the selected ethnically diverse groups.

3. To compare, by analysis of covariance, any similarities or differences among the selected groups of ethnically diverse children.

## Definitions of Terms

Academic readiness: Refers to kindergarten readiness in pre-reading skills of visual as well as language skill areas.

Dominant language: Refers to primary home language spoken by the child.

English language independent: Refers to test conditions during which interpreters translate the directions of instruments to NES students.

Kindergarten: Refers to public school group programs for children 4 and 5 years of age.

Low SES: Refers to low socioeconomic classification level determined by head of household occupational classification according to Bureau of Census (1961). This classification includes blue collar workers, service workers, and unemployed welfare recipients. Children selected for this study were classified as low socioeconomic level by head of household occupations as recorded on Denver Public School enrollment records, and by the address of the child being located in low income housing areas.

NES children: Refers to those students who are speakers of a language other than English. The NES students of this study were classified as Lau A or B. Lau categories refer to HEW guidelines emanating from Lau v. Nichols landmark case for linguistically different children. Lau A includes all children who speak and understand only a language other than English. Lau B includes all children who speak and understand mostly a language other than English. Non-Lau includes all children who speak and understand only English.

Persistence: Refers to task persistence whereas persistence to completion refers to the successful completion of a task.

Standard English: Refers to the English language spoken in United States public schools.

## Limitations of the Study

This study was limited to:

1. Ethnically diverse (Anglo, Mexican, Vietnamese) pupils 4 and 5 years of age, eligible for the public school kindergarten for the school year, 1982-83. The recently arrived Mexican and Vietnamese pupils were all non-English speaking.

2. Data available as of August 1982.

3. Geographical location--Denver, Colorado Metropolitan area.

## Organization of the Study

This study was organized in five chapters. This chapter presented an introduction to the study, including statement of the problem, purpose of the study, justification of the study, hypotheses of the study, definition of terms, and limitations of the study. Chapter II presents a review of the literature bearing on the problem.

In Chapter III, the design of the study and a detailed description of the instruments which were used, are discussed. A restatement of the problem in terms of specific hypotheses and an extended description of the procedures used to gather data and test the hypotheses are presented. Generally, this chapter deals with the methodology and procedures of the investigation.

Chapter IV is devoted to the results of the study and a discussion of these results. An analysis of data, and presentation of the findings in relation to the variables investigated, are detailed, along with relationships between the predictor variables and the criterion variable for each ethnic group. Chapter IV also contains multiple regression equations, comparisons of means among ethnic groups, and ANCOVA statistical tests of the hypotheses of the study.

Chapter V contains a summary of the results of the study, and a conclusion of the study. In addition, it sets forth conclusions, implications, and recommendations for further research.

# CHAPTER II

## REVIEW OF THE LITERATURE

Studies on the prediction of academic readiness in young children are abundant in the literature. However, such predictions using ethnically diverse children as subjects are sparse and mainly focused on a limited range of ethnic groups, specifically Black children or Mexican Americans. For the purposes of this study, the review of the literature explores: (1) predictive studies of academic readiness in low SES, ethnically diverse children who lack English language proficiency, and (2) factors which influence academic readiness including chronological age, general knowledge, intelligence, persistence, and gender of the ethnically diverse students.

Before exploring these factors in the review of the literature related to this study, it appears appropriate to review research conducted on the two non-Anglo groups of children represented in this study: the recently immigrated Mexican child and the recently immigrated Vietnamese child. In Chapter I was cited a brief description of the background of these two ethnically diverse immigrant groups arriving in the United States in the past 10 years. Since the following review of the literature focuses on lower socioeconomic Anglo groups of children but apparently does not distinguish "poor" or "disadvantaged" young children into various ethnic groups, a separate discussion of lower SES Anglo children was deemed unnecessary.

## Studies of Children in Newly Identified Ethnic Groups Relevant to this Research

Since the mid-1970s when the new wave of ethnic groups began arriving, very few studies have been done on and for these young children. When measuring academic readiness for ethnically diverse children, American educators consider: (1) fluency of standard English, (2) language of the test administration, and (3) membership in ethnically diverse groups to be important sources of unexplained variability. Kahn (1966, p. 3) stated that:

> Achievement studies may be summarized by stating the average relationship between cognitive variables, whether taken singly or in multiples, and achievement criteria ranges between .50 and .75; conversely, one-half to three-quarters of the variability in academic achievement remains unexplained by cognitive variables.

Gallimore et al. (1979) studied kindergarten predictors of first grade achievement and found that fluency in standard English was frequently present as a minor predictor. Bergan (1979) investigated the effects of the language of test administration on IQ performance in Anglo and bilingual Mexican-American preschool children and found significant differences in IQ associated with the language of test administration. Gandara (1980) studied the prediction of academic readiness of Anglo and Mexican American kindergarten children and found the kindergarten measures were generally nonpredictive for Mexican American Spanish speakers, and somewhat more accurate for

Mexican American English speakers. In 1974, Melean and Boyle, as stated in Stattler (1982) found with Mexican American children, the Columbia Mental Maturity Scale resulted in scores that were 6 points lower than those obtained by Anglo children (83 versus 89). Lunemann (1974) found low within-ethnic-group correlations between IQ and achievement measures which, in his opinion, suggested the inadequacy of these instruments for appraising IQ in certain ethnically diverse groups.

### Mexican Immigrant Children

Mexican Americans are the second largest ethnic minority group in the USA; there were 5,073,000 in the 1980 Bureau of Census Report. Most Mexican immigrants enter the USA for employment. In 1951, the USA and Mexico jointly accepted a migratory labor agreement known commonly as Public Law 78, yet in 1965 the new immigration act passed by Congress limited the annual immigration from western hemisphere nations to 120,000, with Mexico being given a quota of 20,000. Nevertheless, large numbers of illegal aliens continue to enter the USA from Mexico in search of labor opportunities unavailable to them in their country.

Even very early studies cited in Jensen (1961) show that Mexican Americans score substantially lower than Anglo Americans on IQ tests (e.g., Garth & Johnson, 1934; Coers, 1935; Hill, 1936; Blackman, 1939; Cook & Arthur, 1955). Also in Jensen (1961) are results of more recent studies with such lower scores continuing. Mercer (1973, pp. 167-168) in the Riverside, California studies found differences between the test scores of preschool to adult Mexican Americans and those of Anglo Americans.

> We found that over half of the children 7 months through fifteen years of age who had low IQ's regardless of the criterion cutoff used, were of Mexican American heritage, while only 7.1 to 11.4 percent of those passing the intelligence tests were from this group. . . . Although 79.6 percent of the children in the study were Anglos, only 12.5 percent of those with an IQ below 85 were Anglo. The correlation between ethnic group and IQ was not significant for preschool children--but was significant for school-aged children.

The United States Commission on Civil Rights (1974) stated that the low score of the Mexican American children on IQ tests subsequently leads to their overrepresentation in low ability groups in classrooms in American schools.

Coleman's study (1966) also provides data for comparing the achievement of Mexican Americans with other ethnic groups in such subject areas as reading and math. They are found to be behind Anglo Americans by more than one grade level at the sixth grade with the gap widening in subsequent years. In addition, other studies show that Mexican Americans lag behind Anglo Americans in academic achievement (USCCR, 1974).

Carter (1970) studied Mexican American and Anglo American students attending the same school districts and found the gap between the two groups increases substantially during the intermediate grades: Carter (1970, p. 17) states that:

> Mexican American children start out in school fairly close to Anglos in measured achievement of all kinds. Although they fall slightly more behind the Anglos with each grade, the two groups remain in about the same relative position through the third and fourth grades. After beginning the intermediates, the

> Anglos continue their upward climb, approximating national norms. Sometime in the intermediate grades the Mexican American group begins to fall progressively and drastically further below the Anglo achievement. According to all reports gathered in the field, "mental withdrawal" manifest in boredom, failure to work, inattentiveness, and discipline problems, begins sometime from the third to the sixth grade.

Although the Coleman study shows that Mexican Americans are not the lowest achievers, many educators feel this has little meaning in view of the high dropout rates of this group in public schools. Native Mexicans probably do better in school than second generation Mexican Americans (Ogbu, 1978) because of their high hopes of education as a way out of poverty.

Kagan et al. (1971), in a study comparing behavior in cooperative and competitive situations, found that in cooperative situations the Mexican children were the most cooperative, the Mexican American children next most cooperative and the Anglo children the least cooperative. In competitive situations using the same task, the Anglo children were more competitive than either of the other two groups. Since testing situations are competitive, this may account for in part the lower test scores of Mexican American children; cultural differences and language differences, however, cannot account for total differences (Banks, 1979). Culturally unique learning styles also may represent critical variables in the education of ethnically diverse children (Lesser et al., 1965).

## Vietnamese Immigrant Children

In seeking to understand the Vietnamese, one should heed the words of this Vietnamese saying from the Indochinese Refugee Education

Guide (1979): "Just as the length of a road is known only by actually traveling on it, the qualities of a man are known only by living with him for a long time."

In 1954 the USA gradually became involved in the Vietnamese conflict during the period of declining French influence after the Geneva Agreement. After this conflict ended, major cities of the USA had an influx of Indochinese refugee/immigrants who entered because of political upheaval in their countries. King and VanArsdale (1980, p. 1) state:

> Within the span of five years many American elementary and secondary schools have received large numbers of children speaking no English, but rather the languages of the many new immigrant groups--Vietnamese, Lao, Hmong, Khmer, Korean, Russian, and other languages unfamiliar to American teachers.

Banks (1979) reviewed the population of Vietnamese Americans in the USA. In 1975, after American participation in the Vietnamese war ended and the communists took control of that nation, thousands of Vietnamese refugees immigrated to the USA. While only 226 Vietnamese refugees entered the USA in 1965, over 100,000 did in 1975. Between 1965 and 1974, 17,225 Vietnamese settled in the USA. Banks stated that Vietnamese Americans may be effectively studied to illustrate the problems faced by an ethnic group displaced by a modern war and relocated in an alien and highly industrialized society.

Vietnamese resettlement problems. Richard Butler (1982) described the problems of the resettlement of Indochinese refugees, especially Vietnamese. Since 1975, the influx of refugees has been to escape Communist takeover in Indochina. The USA government turned to private agencies to aid resettlement, but few agencies knew the problems of the Vietnamese and how to help them assimilate into the USA culture. It was a difficult process since few people knew the language or the cultural differences between and among the various groups of Indochinese who entered the USA.

Up to 1975, mostly professionals and soldiers came to the USA; however from 1978 to the present, more farmers and fishermen but less professional immigrants entered the USA. The earlier groups had fewer problems adjusting than the later groups. In addition, there appears to be a change in attitude of the American people regarding accepting any more refugees which has added to their problems.

During the year 1979-80 over 160,000 Indochinese came into the USA during a time of unemployment for many American families. This situation added to the change in attitude of the American people toward the Indochinese refugees.

In 1975 when the Indochinese refugees entered the American public schools, many educators grouped them within the same large Indochinese cultural group rather than into separate ethnic groups. For example, the Hmong, a rural group with little formal education, came from the mountains of Lao, whereas the Vietnamese came from urban cities and were members generally of professional groups including soldiers, teachers, and doctors. The Indochinese Clearing House published pamphlets to differentiate the history and culture of the various groups for better cultural understandings.

There were no studies on the Vietnamese preschool children specifically in USA schools in the search of literature. Wiche (1981) compared the variables of family, society, and religion for refugee groups from Indochina: Cambodian, Hmong, Laotian and Vietnamese. In contrast to the other three groups is the Vietnamese society of the traditional caste system: (1) scholar, (2) farmer/ fisherman, (3) laborer, and (4) business man. Traditionally, teachers are more respected than parents for their knowledge and moral values. Education is highly valued in the Vietnamese society. Sending a preschool aged child to school was not practiced in Vietnam; consequently, few Vietnamese children were enrolled in the USA preschools during the 1970s (Vovan, 1982). This may account for the paucity of studies for this age group besides the general practice of not separating low SES Indochinese children into specific ethnic groups for research purposes.

Although no studies were found on the preschool Vietnamese children specifically, there were studies exploring parental beliefs, behaviors, and values as important intervening variables between sociodemographic factors and child adaptation and achievement. Schaefer et al. (1979) gathered extensive parent interviews, test data, and teacher ratings during kindergarten and from achievement test scores during first grade from a sample of 130 children. Multiple regression analyses revealed substantial predictions of child adaptation and achievement during kindergarten and first grade from parent interview variables, sociodemographic variables, and from these variables combined.

Dermy (1982, p. 17) describes inequities which exist in school curriculums among ethnically diverse preschool students and states:

> We are aware that minority children show evidence of being two to three years behind academically. We know there is much alienation, hostility, and withdrawal among minority children within the institution of the school. But knowing this is no solution. There is a great need to unravel the intricate relationships between the teacher, child, family, and community in order to begin to explain and change present day schooling in America, and the resulting inequities.

## Prediction of Academic Readiness in Low SES Ethnically Diverse Students

This section of the chapter presents research on academic readiness in young low SES ethnically diverse students, including the importance of language proficiency and lower SES in predicting academic readiness. Discussing these variables singly in no way implies that prediction stems from single characteristics, but it is to be noted that interaction between and among variables varies from child to child. Lambert (1967) stated that investigations of academic readiness should emphasize a multivariate rather than a single variable design.

### Academic Readiness and Young Children

Academic readiness, as distinguished from maturation, refers to the time and the way certain skills are taught to children, but is not synonymous with general maturation. It is a composite of many skills and understandings and is generally described in kindergarten in terms of reading readiness since much of the success in American schools is based on reading abilities.

Researchers have recognized multiple factors related to academic readiness. Among the earlier studies, Russell (1949) found that academic readiness in first grade depended upon such general categories or factors as physical, mental, and psychological development and upon the child's ability to see words clearly, to work with a group and to have an interest in learning. Later studies explored more specific factors. Sutton (1955), in a study of 150 children, compared reading test scores with various measures. The highest degree of relationship with reading readiness scores were: language factors (r = .51), enjoyment of listening (r = .44), and mental maturity (r = .51). More recently Gallimore et al. (1976) used the more encompassing multivariate analysis of data for kindergarten and first grade children. Yet, their conclusions were no more helpful, other than to state that "general ability" factors of kindergarteners had the greatest value in predicting first grade achievement.

The United States Office of Education (1970) of the Department of Health, Education and Welfare, Bureau of Research four year study on the prediction of academic readiness in kindergarten and achievement in the first primary year included a series of research studies which provided data in predicting academic success. Study number two of this four year study compared test scores for the same children on a complete assessment battery administered before these children entered kindergarten, with scores on the Metropolitan Readiness Test at the end of kindergarten, and finally with the Stanford Achievement Test at the end of first grade. Test scores were combined for these

48 boys and 55 girls, since age and sex differences in readiness and achievement were not statistically significant. Whole-and part-test scores were treated separately. The Illinois Test of Psycholinguistic Ability (ITPA), language quotient, proved to be a reasonably good predictor of performance on the Metropolitan Readiness Test, with predictability increasing by using only three ITPA subtests instead of the whole ITPA battery. Performance on the Stanford Achievement Test was best predicted by using one ITPA subtest of auditory vocal association and the test of visual motor integration. Throughout the study, The Illinois Test of Psycholinguistic Ability proved to be the best single predictor.

### Academic Readiness and Language Proficiency

The early studies on language development, already focused on the critical role early language development played in later academic success. Loban (1963) in a longitudinal study of children's language from kindergarten through sixth grade found that the children who scored high in reading achievement also scored high in language achievement.

Morris (1967) studied the effectiveness of the Peabody Language Development Kit, Level P for increasing language skills of 4 to 6 year old children in poverty areas. One group was given daily lessons using the Peabody Language Development Kit, Level P in addition to the regular preschool program. As a pretest, both groups were given three subtests from the Illinois Test of Psycholinguistic

Ability (ITPA). After six months the experimental group showed statistically significant gains on two of the three ITPA subtests whereas the control group showed regression on the same two of the three ITPA subtests. The study concluded that the Peabody Language Development Kit Level P may be expected to develop certain expressive language skills of preschool children from poverty areas, and thus aid in their academic performance.

Brittain (1970) found strong positive relationships between second grade childrens' scores on reading achievement tests and their ability to use inflections.

Gray and Klaus (1970) found that children with a great deal of parent-child interaction about the language of school related intellectual concepts were better prepared for the usual school curriculum, than those children with less of the parent-child interactions.

The importance of language as a factor in academic readiness was underscored in the prediction study of academic readiness of Anglo and Mexican American kindergarten children previously cited (Gandara, 1980). The tests given in that study were not language or culture specific. Other researchers have emphasized the importance of language proficiency in academic readiness. Nurss (1980) found that the amount of syntactical knowledge and vocabulary accessible for use in beginning reading is determined by the child's language proficiency. Dermy (1982) described reading as language based, and concluded that children must be able to use the oral language structures which they have already acquired in order to succeed in school.

Moe (1957) found first grade children's auditory comprehension based on standardized reading selections read to him to be a better predictor of academic achievement than were several common readiness or intelligence tests.

Yet, Martin (1965), however, observed first grade children intensively and found that childrens' total number of words used in oral communication, average sentence length, and number of different words used generally all had negligible significance. He found that language skills followed individual patterns and were not related to each other, to readiness, or to academic achievement. Few, if any, linguists would agree with Martin today. Most researchers do not agree with Martin; they have found positive relationships between academic readiness and language development as the several studies just cited show.

Language development research generally points to significant differences between middle class and low SES children (Bernstein, 1961; John & Goldstein, 1964). Bernstein (1961) who intensively studied the linguistic abilities of children, emphasized status as a major social determinant of speech patterns. He pointed out that the lower SES child usually uses restricted, simple, informal language which expresses primarily concrete needs and immediate purposes whereas the middle class child uses more formal language that emphasizes the relating of intellectual concepts. Casler (1961), John (1963), and C. Deutsch (1964) investigated the role of feedback in language development and found this feedback does not play such a central role in child rearing in low socioeconomic homes as it does in middle class homes.

Clasen et al. (1969) studied an intensive language training program which resulted in improvement in linguistic skills of children from low income families; this language training program resulted in a carryover of these skills through the kindergarten year. Five year old children from low income families who had participated in two types of Head Start programs for eight weeks were the subjects of the study. One group received only incidental attention to language skills in a program oriented to social development, whereas the other group received an intensive language development program. The Stanford Binet Intelligence Scale and the Illinois Test of Psycholinguistic Ability were used to determine short-term gains. To determine long-term gains on achievement, the groups were evaluated on a behavior checklist filled out by kindergarten teachers. The results of this study showed no significant difference in intelligence test scores between the two groups that could be attributed to the difference in treatment. However, differences in Illinois Test of Psycholinguistic Ability test results were found in favor of the language trained group. The behavior checklist filled out by kindergarten teachers showed no significant differences between the two groups in the ratings either.

Most current research in language development as a predictive factor for later school success indicates that birth to 12 months may be the most crucial period for stimulation and/or intervention.

## Academic Readiness and Low SES Ethnically Diverse Students

Oscar Lewis (1966), an anthropologist who worked in the Latin American slums, studied poverty and identified characteristics he felt were common to impoverished communities the world over. Among the characteristics were a lack of cash flow and savings; fear of the larger society; social structures enhanced by a physically contained community; matriarchial and authoritarian families; as well as early maturation of children and feelings of helplessness and fatalism among individuals. Lewis emphasized that as economic and social oppression continued, a culture of poverty developed that was passed on from generation to generation.

The culture of poverty concept has come under increasing attack. Rist (1970) and Ogbu (1978) suggest: (1) that studies which lump poor children together with no regard for ethnic, cultural, or regional differences are fallacious; (2) that there are inadequate studies of social and psychological conditions in childrearing in various ethnic groups and in various socioeconomic classes; (3) that differences in childrearing within ethnic groups might account for SES differences usually found in academic readiness studies of low SES children; and (4) that a stereotype of the American poor family has developed in which parents are characterized as harsh, inadequate disciplinarians, and the environment is characterized as either understimulated with insufficient interaction or overstimulated with noise and fighting. The culture of poverty concept suggests that children fail primarily because of the environment in which they live.

Yet, we do have a number of pioneering studies of children from lower SES environments; these studies emerged from the 1960s War on Poverty and the establishment of Head Start. Few of these studies are reported recently, probably due to lack of funding for research in this area.

Lesser et al. (1965) pointed out the importance of pattern of abilities in ethnically diverse students whether or not they were from lower SES environments. A large group of first grade children were tested and divided according to both socioeconomic and ethnic background. These subgroups were compared both in terms of average scores across several kinds of tests and in terms of patterns of scores in the several kinds of tests. Average scores across all tests were associated mainly with social class; the higher the socioeconomic class the higher the general level of ability as measured by the tests. On the other hand, ethnic background was associated with the pattern of scores on the several tests. Black, Chinese, Jewish, and Puerto Rican children differed substantially in terms of the several tests on which they shared high scores and the several tests on which they shared low scores. These ethnic differences were consistent across levels of socioeconomic status. Thus, from the same ethnic background, lower class Chinese children manifested the same pattern of abilities as did higher class Chinese children. The same manifestation held true for the other ethnic groups in the study.

Children from low SES backgrounds were the subjects of a study by Gray and Klaus (1970) to determine if a preschool intervention program would be effective in offsetting academic retardation when the children reached elementary school. For three summers of 10 weeks each, the preschool intervention program was conducted. Three groups were selected randomly: two experimental groups and one control. One group participated in the summer program followed by weekly home visits from teachers during each of the following two years to reinforce the training in the summer program. The second group participated in two summers of the intervention program, and two follow up years of home visits. The third group received no preschool intervention program but was given the same tests as the other two experimental groups. In implementing the summer intervention program, the activities used were similar to a traditional preschool program, but they emphasized the development of attitudes and aptitudes necessary for success in public school. By the end of the first grade, the two experimental groups scored significantly higher than the control group on three of the four subtests of the Metropolitan Achievement Test. At the end of second grade, five subtests of the Metropolitan Achievement Test were again administered to the three groups, and at this second testing the two experimental groups again scored significantly higher than the control group but on only two of the subtests. However, at the end of the fourth grade, when retesting was again conducted, the two experimental groups no longer scored statistically superior to the control group on the Metropolitan Achievement Test. Although the two experimental groups had scored significantly higher than the control group on achievement tests during their first two years of school, at the end of the fourth grade their performance was only slightly better. Gray and Klaus concluded that it was possible to offset academic retardation when the children reached elementary school, but there was a decline in academic achievement as the children progressed through the grades. They stated that preschool experiences can only form a basis on which the home and elementary school can build, but that considerable reinforcement from both the home and subsequent schooling are necessary to retain the early gains made by a preschool intervention program.

Herzog et al. (1972) found that an adequate evaluation of a preschool program necessitated recognizing different socioeconomic levels within a geographic area designated as a poverty area. Their study was designed to determine the extent to which a preschool program could enhance school readiness of 3 and 4 year old children from low economic areas. The study consisted of an experimental group who attended a preschool program for two years and a control group who did not. The mean IQ score of the control group was significantly higher than that of the experimental group when the program began, but two years later when the program ended, the mean IQ score of the experimental group was significantly higher than that of the control group. After the two groups completed kindergarten, first, and second grade, the mean IQ scores of the experimental group remained above that of the control group. However, both groups showed a decline in IQ scores by the end of the third grade. A subgroup of the experimental group characterized by a relatively high socioeconomic, initially low IQ entered the preschool program with an IQ within one point of the lowest mean IQ score. However, after three years, this same subgroup had achieved the highest mean score of any of the subgroups in any year. After two more years, this relatively high socioeconomic low IQ subgroup was still scoring above either of the other two subgroups within the experimental group: the high socioeconomic, high IQ and the low socioeconomic high IQ subgroups. Herzog et al. concluded that the socioeconomic factor was related to the achievement of the high socioeconomic, initially low IQ experimental groups. They further concluded that socioeconomic status exerted an influence on the groups regardless of program, because in both the experimental group and in the control group, the high socioeconomic, initially low IQ subgroups gained more in IQ points than any of the other subgroups.

## Factors in This Study Which Contribute to the Prediction of Academic Readiness

This section of the review of the literature presents research findings related to the independent variables utilized in this study to predict the dependent variable of academic readiness. These independent variables are: (1) chronological age, (2) general knowledge, (3) intelligence, (4) persistence, and (5) gender of the student.

## Academic Readiness and Chronological Age of the Student

A Harvard report on reading in elementary schools stated that chronological age was used as criterion for first grade admission in 68% of schools in the USA (Austin et al., 1963). Many educators believe that at first grade entrance, chronological age is a moderately good predictor of success in the elementary grades. However, determination of chronological age in ethnically diverse children is not always possible. King (1982, p. 104) describes the issue of how researchers, educators, and professionals working with young children have used chronological age as a variable.

> It was apparent as one surveyed the literature that the concept of age in young children (under six years of age) was an assumed variable. Researchers merely state age and never question how it was arrived at in the cohort or group of children under study. It was assumed that the age of a child or group of children was as stated on official records. This is part of the cultural naivete and ethnocentricity of western social science and scientific research. It often does not occur to educators or researchers that one should question the statistical information obtained about the age of a child or group of children. When dealing with folk societies a much different picture arises in the assessment of age from birth to death in the life cycle of non-western non-technologized and non-industrialized societies.

Van Arsdale (1980) stated that chronological age is not reckoned in many societies, yet these estimated ages are often treated statistically as if they were precise numbers based on known years of birth. He emphasized that in the future, improved techniques for age estimation and measurement will play an increasingly important role because of the need for valid, reliable cross-cultural comparison studies.

There has been a trend toward progressively earlier chronological age admission standards for preschool entrance. This trend has rarely been challenged. However, some educators suggest that early formal schooling may actually be detrimental to young children. Moore and Moore (1975) challenged the early trend on the basis of three arguments, namely: (1) neurological growth patterns and sensory development are normally not complete until 7 or 8 years of age; therefore premature introduction of complex sensory activities such as reading may not only be inefficient but possibly adverse for normal development, (2) programs for preschool education have failed to show lasting advantages, and (3) young children separated too soon from their mothers are more vulnerable to emotional distress and disorder. Rohwer (1971) presented evidence that younger children are less adept at organizing verbal information in ways to increase their learning rate, and suggested that the years of late childhood represent a much more efficient period for learning many skills now attempted in kindergarten programs.

Teaching reading at an early age. The trend for teaching of reading at earlier chronological ages was apparent in the review of the literature. Among those advocating teaching of reading to very young children, Doman (1964) in his book entitled How to Teach Your Baby to Read, stands out as the most extreme author. Other writers advocating very early instruction in reading are Ledson (1975), Johnson (1971), and Emery (1975). Some researchers believe that large numbers of typical kindergarten children can, and should, be given instruction in reading skils (Brzeinski, 1964; Durkin, 1966).

The Denver experiment, a study of 4,000 Denver school children, was designed to determine whether beginning reading could be taught effectively in the kindergarten (Brzeinski et al., 1965). Four groups of entering kindergarteners were studied through the fifth grade. The subjects were randomly assigned by their respective schools to experimental groups for kindergarten reading instruction totaling 2,500 students, and to control groups totaling 1,500 students. The kindergarten program of the two groups was similar with one exception: the experimental groups were given daily reading instruction for 20 minutes whereas the control groups followed the regular kindergarten program.

When these two groups later entered first grade, both the experimental and control groups were divided into two subgroups, making the four groups of the experiment. Group 1, the control group of 750 students had a regular program in kindergarten and a regular program in the first and later grades. Group 2, a delayed experimental group of 750 students, had the regular program in kindergarten, the experimental program in early first grade and an adjusted program in later grades. Group 3, the short term experimental group of 1,250 students had the experimental program in kindergarten and the regular program in the first and later grades. Group 4, the experimental group of 1,250 students had the experimental program in kindergarten and an adjusted program in the first and later grades.

The major findings of this study were that: (1) beginning to read sight words can be effectively taught to large numbers of typical kindergarten pupils; (2) the gains made by the experimental group could be maintained only by following up the kindergarten year with an adjusted teaching program in the subsequent grades built from where the kindergarten program ended; (3) the experimental kindergarten Group 4 showed the greatest initial and long-term gains in both reading comprehension and reading vocabulary and read with greater speed than any of the other groups when tested at the end of the third grade, and (4) no evidence was found that early instruction in beginning reading affected visual acuity, created problems of school adjustment, or caused a dislike for reading. The children participating in this study had a wide range of abilities and were representative of backgrounds usually found in large urban schools; they were found to profit from beginning reading instruction in the kindergarten, with some profiting more than others.

Some children learn to read at home before coming to school; Durkin (1962) reported on such children. In a study beginning in September 1958, all beginning first grade students in a California school system were individually tested to identify those who had learned to read at home. From a total group of 5,103 children, 49 were found to have reading ability. To examine the future value of this early start in reading, two groups were formed. The experimental group included 25 early readers, and the control group included 201 children who had entered school with the early readers but who could not read when they started to school. In the experimental group, 15 of the early readers had IQs of 100 to 120 and the higher the child's IQ, the greater the chance the child started to read early. No evidence was offered to indicate whether the children who started to read at an early age maintained their advantage over children of comparable IQ who did not begin to read until the first grade. Yet, generally, the child who learns to read by himself prior to kindergarten is almost always of superior or gifted range.

During the 1960s, Moore of Yale University received much publicity because of his early reading techniques (Sheldon, 1967). The film, entitled Early Reading and Writing, presented a step by step account of the procedures used to teach 2 and 3 year old children to read. Moore's experiments included teaching very young students through the use of an adapted electric typewriter and tachistoscope which presented words and phrases to them. He succeeded in teaching several young children to recognize hundreds of words and to read and write with some competence. His novelty techniques were motivating factors, yet he illustrated that one can teach young children to read isolated words. He did not claim to teach reading with comprehension.

Using television in early academic readiness. The medium of television was also used as a technique to assist parents to prepare preschool children for reading success. Brzeinski (1964) described this Denver Public School program which involved parents of preschool children teaching certain prereading skills to their own children at home. Four hundred fifty parents of children aged 4-1/2 to 6 years of age were divided into three experimental groups. Group 1, a control group of about 150 parents, received no instruction in teaching the basic prereading skills to their children. Group 2, an experimental group of about 150 parents, was instructed via a series of 16 weekly television programs on how to teach the letter names and letter sounds; how to teach recognition of common sight words; and how to identify words by the initial consonant sound and by their context. The television lessons included demonstrations with a father, mother, and child participating. Group 3, another experimental group of 150 parents, was given the same instruction in small group meetings with a certified teacher in charge. Both Groups 2 and 3 were also given the booklet entitled Preparing Your Child for Reading which contained 16 lessons designed to follow the television programs. This booklet contained teaching materials on the prereading skills which were not usually found in the home. Parents in Groups 2 and 3 were instructed to work with their children for a period of from 15 minutes to 30 minutes daily on prereading skills.

Upon entering first grade, all pupils in the television study were given the Stanford Binet Intelligence Test and two subtests of the Test of Basic Skills for beginning reading. Brezeinski stated that the amount of time the parents practiced with their children was directly related to achievement. The best performances on tests were made by children who had practiced the beginning reading activities for more than 30 minutes each week and who had been read to by parents for more than 60 minutes each week in the period before first grade. He stated that statistically significant gains in achievement were made by those students who had practiced with parents for 30 minutes or more each week.

Although both Denver studies are criticized for using one or two variables rather than multivariables, and failing to follow the students who made short-term gains over a long-term period of at least third grade, they were the first large scale attempt to show that typical young children can be given instruction in reading skills.

United States school entry age. There have been many attempts to discover the optimum time for beginning formal schooling. School entrance policies were influenced early in many American school districts by Morphett and Washburne (1931). In contrast with the preceding section, they found that groups of children with the average mental age of 6-1/2 or even 7 years were more successful in first grade reading than groups of children whose mental ages were less than 6-1/2 years. Their data were gathered from a comparison of the mental abilities and reading achievement of first grade children in the Winnetka, Illinois school system; Winnetka is the most affluent town in Illinois. These results were taken to mean that since fewer children or higher mental ages failed in beginning reading, children should not enter school until they had reached the chronological age of 6 years and should not begin reading until they had reached the mental age of 6-1/2 years of age. Gates (1937), however, found in one of four classes he studied that children with a mental age as low as 5 could successfully "cope" with first grade reading. Prescott (1955) studied over 14,000 first grade students and found no significant differences in readiness between overage and underage students and stated that chronological age had very little significance in determining children's academic readiness or subsequent success in academic achievement.

The success of underage children was reported by Hobson (1956) in a study conducted in the public schools of Brookline, Massachusetts. The average marks and achievement test results of underage children were higher than those of other children in every grade in the schools, with the exception of kindergarten. The margin of superior academic success actually increased as these underage children progressed through the eight grades of elementary school. For the past 30 years, the Brookline Public Schools have been admitting children to kindergarten with the minimum chronological age of 4 years and 9 months; and children as young as 4 years of age have been admitted after physical and psychological examinations. The success of these underage children demonstrates that age is not a highly significant factor in academic success, but the MA must also be determined.

Age for school entry in other countries. Advocates of the introduction of beginning reading instruction in the kindergarten curriculum argue that certain other countries begin formal schooling at this early chronological age without apparently harming the children emotionally or psychologically. However, these advocates often fail to mention that when 5 year olds are introduced to reading as in the British infant schools, their reading instruction is highly individualized for those who show readiness and group reading instruction, as practiced in the USA schools, is not common.

Malmquist (1962) reports that children in Sweden start to school about a year later than children from the USA and England. Swedish educators feel that based upon both psychological research and pedagogical experience it is to the children's advantage to start school as late as 7; this late beginning age is one of the important reasons why comparatively so few children have reading disabilities in the elementary schools in Sweden.

Matthews (1959), in a description of the Soviet kindergartens as they have developed during the past 40 years, states that the teaching of reading and writing is not intended to start in the kindergarten; instead it grows out of the language program of the kindergarten. The Soviet educators view kindergarten as a time of informal learning with structure only on language activities which precede reading.

Vernon (1959) studied Scottish children and found that 8 year old Scottish children who were taught to read at the age of 5 were not significantly more able in reading comprehension than a comparable group of English children whose reading instruction began at the age of 6. Vernon pointed out that while 5 year olds may be successful in visual discrimination activities, they may have real problems in auditory discrimination. He asserts, in addition, that the short attention span of young children has a negative effect on sequential learning.

Almy (1975) compared the age for beginning formal school in other countries. She found that in Sweden, the Soviet Union, Peoples Republic of China and the Netherlands, formal schooling does not begin until the age of 7. In the United Kingdom, children enter the infant school at the age of 5, but may or may not begin formal schooling in reading until they are considered academically ready, and even then the trend is toward informality with some reading instruction for selected children.

Among the Indochinese refugees who have entered the public schools recently in the USA, traditionally education of their young varies across groups. In Vietnam, education tends to follow rigid academic lines and bears a strong resemblance to European schools. Children start to school after examinations are given to qualify them to enter the school environment, and readiness versus age is the criteria for education of the young Vietnamese children (Vovan, 1982). Cambodian, Hmong, and Laotian children are counted as 1 year old when they are born (Wiche, 1981). The date of their birth is generally not recorded by the Bureau of Vital Statistics as in the United States, but rather remembered in the family according to some other happening coincidental with birth. For example, the planting of crops in the spring. The recent upheaval in Indochina left many young children without any formal schooling before they recently came to the USA.

Until the War on Poverty and the advent of project Head Start, children of ethnic minority groups did not traditionally attend school until kindergarten or first grade; presently Head Start and some early childhood programs in public schools attempt to reach these children. As in most societies, ethnic minority groups in America are disproportionally represented in the lower socioeconomic classes, which in turn are heavily concentrated in the blighted sections of rural and urban areas (Banks, 1979).

Cross cultural perspectives on age for school entry. Carroll (1963) determined from his study of younger and older entrants in first grade that the additional growth and development the older children had when they entered first grade seemed to give them the advantage over the younger children. The study was conducted to determine whether third grade students who had entered first grade before they were 6 years of age would differ in first grade reading and mathematics achievement and school adjustment significantly from their classmates who were 6 years of age or older when they entered first grade. Twenty-nine pairs of third grade students were matched on sex, IQ, socioeconomic status, and schools attended. The matched groups were both tested using the California Reading and Arithmetic Achievement Tests. The results of this study were that the older children made significantly higher scores than the younger children. However, on only two of the 10 criteria used to rate the children on social adjustment, the older group was rated significantly higher than the younger group.

Dickinson et al. (1963) also studied the effects of chronological age at the time of entering school on later school achievement. Subjects were 400 fourth grade students of regular age at entry into first grade. The total group was tested using the Iowa Test of Basic Skills. They were then divided into four groups based upon the youngest chronological age to the oldest chronological age. The youngest one-fourth of the class was compared with the total three older groups of the class, and then also compared to each of the remaining three age groups individually. The findings of the study were that the youngest one-fourth of the class had a significantly lower mean IQ composite score when compared with the three other groups of the class. As the chronological age of the groups increased, the number of children who had IQs below 100 increased. The authors concluded that the older a child is chronologically upon entering school, though he has an IQ less than 100, the better chance he has of not failing a grade in school.

Piaget (1967) describes the age range of the child from 5 to 7 years of age as one of transition. He states that children of this age move back and forth between the preoperational and concrete stages of intellectual development. Therefore, children's performance even from one day to the next, is less reliable and less consistent than during the later years. During this age range, a lagging child might forge ahead and a precocious one might slow down, a fact which might significantly affect the test results of individual children at different points in time. Hirst (1969) also points out that the ability to learn does not suddenly blossom at the age of 5 or 6, but rests on attitudes and competencies that develop at much earlier ages. To approach learning in terms of age does not appear to be the criteria for determining when to intervene with a formal learning situation.

Comparing ages in which other cultures begin formal schooling also has the inherent problems of cross-cultural research. The interpretation of data gathered from another culture can be risky business. In comparing two or more cultures, it is necessary to study different people in a comparable manner, and therefore much concern needs to be given to data gained from cross cultural research. It is necessary to be aware that tests formulated by the western mind are bound by this perspective, and the analysis of data thus gathered can only be within this framework (Maccoby et al., 1966; Greenfield et al., 1966; Glick, 1975; Furby, 1971). Delacey (1970) studied four groups: the isolated rural aboriginal, the aboriginal with close European contact, the high income European in Australia, and the low income European in Australia. He found a marked relationship between the degree of enrichment in children's environment and the particular area of mental growth manifested in the ability to classify. Cross cultural researchers have demonstrated that many advantages of cross cultural research may be gained, but that an awareness of the complications within this research are necessary to properly use the information gathered.

Hunt (1969, p. 73) described changes in the conception of school readiness with regard to the chronological age of the child.

> Starting young children in school at six or seven years of age is a custom that goes back to the days of Rome or Greece. During most of the past century we have explained this custom in terms of the concept of readiness. As a corollary of the belief in predetermined development, readiness has been conceived to be a stage in development at which the child arrives more or less automatically, through the predetermined process of maturation.

Although our society has recognized the need for differential opportunities for learning for different ages in the lower socioeconomic classes of our society by funding such programs as project Head Start, ironically, age still determines the admission of children to these programs.

There are various points of view of the child as a student, and the age at which formal schooling should begin depends on one's point of view. Also the time academic readiness begins is influenced by one's point of view. Probably academic readiness is on a continuum with e.g., some college students being more academically ready than others for the study of their chosen fields.

### Academic Readiness and General Knowledge

A reemphasis on the importance of the role of the environment in the literature of the 1960s provided a most important rationale for studies relating academic readiness to general knowledge gained by children from their preschool environments.

Coleman et al. (1966) surveyed over 600,000 children enrolled at several grade levels in approximately 4,000 schools. They found that home background was the most important element in determining how well children did in school. Bronfenbrenner (1973) suggested an ecological intervention approach for the most deprived children by which the parents and other child-caring adults in these deprived home environments would be supported to obtain adequate health care, housing, and employment.

For the child to acquire general knowledge from the home environment and thus realization of the child's potential, usually requires stimulation. White (1967) investigated the plasticity of the brain for benefitting from early visual motor development. An experimental group of infants who had been subjected to enriched stimulation during child rearing from birth to 12 months developed top level reaching behavior in 60% of the time required by the control group. Schaefer (1965) reported that infants who received auditory or verbal stimulation five times per week for one hour beginning at 14 months, and whose verbal development was encouraged through friendly and spontaneous communication with a teaching adult showed increasingly superior intellectual performance at 20 months when compared with a control group of infants who had not been stimulated.

As the environment of children in school broadens during the intermediate grades, the range of information that adds to the general knowledge of children assumes significance. Holmes et al.'s (1961) detailed studies for the United States Office of Education analyzed factors underlying success in reading at the fourth grade and higher levels in the elementary school. These studies confirmed the importance of the general knowledge children bring to their reading study. However, at the primary levels, the reading materials are based upon more simple, common daily experiences and the demands for such general knowledge so slight, that the range of information is not so often a crucial factor. The average child has sufficient experiential and informational background to understand the basic story reading texts, with the exception perhaps of bilingual children or newly immigrant children. However, the few understandings they may lack may be readily supplied by the exchange of ideas and information in the primary classrooms through films, field trips, or role playing.

During the 1960s War on Poverty, there was sufficient interest and money to provide enriching environments and experiences to increase the general knowledge of children from low SES environments. The general knowledge children had acquired was usually measured on achievement tests, and generally young children from low SES environments scored below children from middle class environments. Martin Deutsch (1964) and his associates at the Institute for Developmental Studies in New York worked on accelerating the cognitive development of preschool children in order to increase their general knowledge, and researched the question of early intervention in order to facilitate the intellectual development of low SES children.

Gaining general knowledge from the preschool environment has been investigated by many researchers. Hunt (1961) suggested a match between the child's developmental level and the educational materials presented to him. The problem for educators is to match the teaching with the particular skills and learning styles of children and to motivate them toward mastery of skills. When teachers have their expectations based on children from only middle class Anglo children, the problem of the match becomes especially difficult when working with ethnically diverse low SES children.

Fowler (1962) emphasized the potential of the preschool environment for cognitive education. He noted that patterns, habits, learning sets, and interest areas are more favorably established at an earlier than later stage of the developmental cycle. Bruner (1961) viewed the educational process at the preschool level as a spiral curriculum. His well known hypothesis (p. 33) is that: "any subject can be taught effectively in some intellectually honest form to any child at any stage of development."

Gaining general knowledge, and particularly the ability to handle abstractions depend generally on a broad diversity of experiences in the preschool environment. Piaget (1960) stated that the more new things children see and hear, the more things they are interested in seeing and hearing, and the more sensory motor experiences children have in the early years, the more apt they are to progress satisfactorily to the preoperational stage of intellectual development.

Almy et al. (1975) conducted a cross sectional study and a longitudinal study of children as they progressed through kindergarten, first and second grades in order to determine the validity of Piaget's theories regarding children's stages of intellectual development. Children's ability to conserve number and quantity were measured in three tasks; then the relationship between the ability to conserve, school readiness, and other intellectual abilities was studied. The results of the study confirmed the relevance of Piaget's theories of conservation to the study of young children. Almy stated that children who are able to perform conservation tasks at an early age generally perform better on tests related to mental ability, beginning reading and arithmetic.

Cognitive development and general knowledge. Hoock (1974), in evaluating early learning centers affiliated with a large city school system, found that a one-year program of cognitive activities designed to increase the range of general knowledge for 4 year olds aided in their development of readiness for school. In a follow up study of children in the first through third grades who had participated in the city's preschool intervention program, he found that these preschool groups had made progress in reading achievement that surpassed any previous achievement records in the system. In preschool, on the Cooperative Preschool Inventory, the experimental group scored significantly higher than the control group and on the Beery Developmental Test of Visual-Motor Integration the experimental group had a significantly higher mean score than the control group. In kindergarten, the groups were tested again on the Cooperative Preschool Inventory and the experimental group scored higher than the control group. At the end of grade one, the groups were tested using the Stanford Primary 1 Reading Test, with the result that the experimental groups who had been in the preschool program scored higher than the control groups who had not. At the end of grade two, the children who had participated in the preschool intervention program, scored higher on the Metropolitan Reading Tests than those children who had not participated in the program. Hoock concluded that the district's cognitively based preschool programs were effective in offsetting handicaps in readiness for school.

Karnes (1968) conducted a study in which five different intervention programs were compared to determine their effects on the academic development of 4 year old children from low SES environments. The programs compared were: (1) a traditional nursery school program, (2) the Karnes Ameliorative Preschool program, (3) the Montessori program, (4) the Bereiter Engelmann program, and (5) the Community Integrated program. The Stanford Binet Intelligence Test and the Illinois Test of Psycholinguistic Ability were used for pre- and posttest comparisons. The children in the Bereiter Engelmann and Ameliorative programs made gains that were significantly superior to children in the other three programs. Karnes concluded that the two structured programs significantly aided the academic functioning of the low SES children in this study when compared to the other three programs.

Weikert et al. (1970) conducted a longitudinal study to determine effects of a two year preschool intervention program for 3 and 4 year old children from low SES environments who had been diagnosed as functionally mentally retarded. The preschool program was oriented toward cognitive development, with inclusion of parent education through weekly home visits by program staff to encourage parent participation in the educational process. After one year in the program, the Stanford Binet Intelligence Test was administered. The mean scores of the experimental group were significantly higher than those of the control group; this significant difference was maintained through the second year of the program. The children were followed as they progressed through kindergarten, first and second grade, but at the end of the third grade the differences had disappeared. The California Achievement Test was administered also at the end of the first grade to measure academic achievement besides the Stanford Binet measurement of IQ. There was a significant difference in favor of the experimental group on total raw score means. This difference, however, continued after the third grade in contrast to the lack of differences at the end of third grade measured on the Binet. Weikart et al. concluded that the goals of the program had been attained because of the advantage the preschool intervention group had maintained in the regular public school program. The findings of the study were that children who took part in the preschool program showed significant improvement in cognitive functioning, with this improvement continuing for at least the three years it was regularly measured.

The impact of Head Start on general knowledge. The Westinghouse Learning Corporation (1969) conducted a study for the Office of Economic Opportunity and Ohio University that caused furor in the low SES Head Start community. The study attempted to determine to what extent children who had attended Head Start programs differed in intellectual, social, and personal development from comparison groups who did not attend Head Start. Sample groups of children who had attended Head Start centers and had gone on to first, second, and third grade were matched with comparison groups. At the first grade level, on the Metropolitan Reading Tests, beginning first graders who had attended full-year Head Start programs scored significantly higher than the comparison group on total readiness and listening subscores; but the summer-only Head Start group did not score significantly higher than the comparison group. At the grade two and three level, the Head Start groups did not score significantly higher than the comparison groups on the Stanford Achievement Test. The conclusions derived from this study were that the summer programs seemed to be ineffectual in producing cognitive gains that carried over into the primary grades; the full-year Head Start programs appeared to be only somewhat effective in terms of producing gains in cognitive development evident in first, second and third grades.

The Stanford Research Institute (1971) evaluations of the 1969-70 full-year Head Start programs included two tests of number and letter recognition skills as a measure of school readiness. Comparing fall pretest and spring posttest scores for 1,578 children, the Institute found that the number recognition skills of 79% of the children improved by the end of the Head Start school year. The gains were larger than would have been expected without the Head Start program according to statistical projections. The magnitude of effects appeared to be related to teacher variables. Teachers without either a B.A. degree or at least two years of teaching experience did not appear likely to help children gain on the school readiness measures.

Smith (1973) on a national sample of Head Start children attending the 1969-70 and the 1970-71 programs found substantial gains on measures of school readiness. After controlling for chronological age, gender, family income, household size, mothers' education, prior Head Start experience, and the interactions among these variables, Smith concluded that the typical Head Start experience accounts for roughly 70% of the total gains on measures of school readiness.

Although many researchers agreed with the results of the now well known Westinghouse Report (1969) (Grotberg, 1969; Smith & Bissel, 1970), other researchers reanalyzed the Westinghouse summer data with a different correction for possible selection biases in who had attended Head Start itself, and found statistically important effects of summer Head Start attendance on children's subsequent performance (Barnow, 1973; Magidson, 1977).

## Academic Readiness and Intelligence

Although various studies have cautioned against placing too great an emphasis upon intelligence as the major factor in academic readiness, other studies have emphasized that intelligence is an extremely important determinant of academic readiness. Spache et al. (1969) reviewed 27 first grade studies from 1954-1966, and stated that relationships between readiness factors and intelligence vary considerably from one instructional method to another and from one classroom to another. Mental age scores have generally been found to be closely related to reading readiness. Many studies and reading readiness test scores to range from about .35 to .80.

Intelligence tests and achievement tests have some similarities yet differences do exist. Humphreys (1962) found three major differences at the level of item selection or content. All are differences in degree, rather than in kind. The differences are: (1) intelligence tests include items of a wider variety of kinds than do achievement tests; they are more heterogeneous with respect to content than achievement tests, (2) as a corollary of the first difference, intelligence tests tend to sample a wider variety of experience both in and out of school than do achievement tests, (3) intelligence tests differ in the amount of time between original learning and the administration of the test. The achievement tests are typically aimed at relatively new learning whereas intelligence tests typically depend on the older accumulative learning. Consequently, when the total scores on a broad series of achievement tests are correlated with scores on an intelligence test, the resulting coefficient is approximately as high as the coefficients obtained by correlating the scores from one form of a test with scores on another form of a test.

Although the definitions of intelligence found in the literature are many and varied, the major question educationally becomes a matter of trying to differentiate behavior which is considered intelligent from that considered unintelligent. It is meaningful educationally to speak of functioning intelligence. Guilford's (1956)

Structure of the Intellect Model puts an emphasis on divergent producing or creative abilities. In his model, 120 separate abilities are posited, and neither general nor group abilities are recognized. A system of education designed to individualize the curriculum through identification and nurturing of different abilities follows logically from this concept.

Hunt (1961) and Jensen (1969) are at opposite ends of a continuum on how much one can raise intelligence scores through the environment. Hunt (1961), in his book Intelligence and Experience, challenged a belief in fixed intelligence and offered as an alternative, a theory which stressed the importance of environmental experiences in the development of intelligence. This theory served as rationale for the early work in preschool intervention programs in low SES areas. His theory gained support from a study by Bloom (1964) entitled Stability and Change in Human Characteristics in which he argued that intelligence was plastic in the preschool and early elementary school years. Jensen, a hereditarian, on the other hand, stated that compensatory efforts have failed since genetic factors are such overriding determinants of behavior.

Research on IQ in low SES children. Zigler (1977) found children living in low SES areas display the same distribution of IQ scores found among more affluent children. While the mean of IQ scores among the low SES children is generally 10-15 points lower, this deficit appears to reflect a difference, not in ability, but in performance between socioeconomic groups on tests of intelligence. Zigler (1973) further stated that research has suggested that there may be 10 points of unused IQ in children from low SES areas that they do not apply in testing situtions or in school environments because of motivational factors that interfere with their performance.

Social class appears to be a crucial factor in children from low SES environments test performance. Weiner et al. (1950) administered the Reading Prognosis Test to lower and middle class populations and found significant relationship between socioeconomic status and test scores. He stated that conventional prognostic instruments do not yield interpretable test scores for children from low SES environments, and that there appears to be complex inter-relationships between intelligence test scores and socioeconomic status.

Early intervention programs and IQ. Many programs were conducted during the War on Poverty in the 1960s; the early reports of changes in IQ as a function of exposure to these intervention programs were discouraging. In most studies, IQs rose immediately after treatment, but regressed to the level of the control groups a year or so after intervention terminated. Although the use of the IQ measure for evaluation of programs is intensely debated, in practice, most of the studies concerned with early intervention used some form of the IQ measurement in the early stages. A report by Study Analysis of the effects of early intervention programs on subsequent IQ test scores led to the conclusion that some preschool intervention programs appeared to influence the variable significantly while others did not; it can only be concluded that early intervention frequently affects IQ scores but does not always do so (Zigler et al., 1979).

Cross cultural perspectives on intelligence. Very little is known about the way other cultures define intelligent behavior, but the cognitive skills developed and demonstrated by members of different cultures usually reflect their prior experiences. Dennis (1970) summarized scores on the Goodenough Draw A Man Test and concluded that there is a strong correlation between the involvement of a given group with representational art and the test scores of its children. The test was given to children from 40 different groups all over the world. Dasen (1973) studied cognitive development in Australian aborigines and white Australian children. He found that the white children develop logico mathematic concepts before they develop spatial concepts but the Black children developed the spatial concepts first. He interpreted this to mean that the aborigines develop spatial concepts more readily than logico mathematical concepts because the former are more important to the nomadic hunting and gathering economy of the aborigines. Levine (197) criticized cross-cultural studies by western researchers. He stated that western tests tend to measure mainly those cognitive skills which would enable children to participate effectively in western schools and not the skills and strategies other cultures have developed to adapt effectively to their own environments.

Nevertheless, American educators have long believed that children's intelligence is a crucial factor in determining school readiness, and in this context the word "intelligence" stands for a score on an intelligence test. Such IQ measurements sample a wide variety of competencies and probably represent some interaction between environment and potential. In the early elementary school grades, educators are no longer so optimistic about the validity of IQ as a predictor of academic success; however in the higher grades when reading tasks demand more advanced linguistic and cognitive competencies, verbal intelligence test scores appear to be far better predictors of academic achievement. It is noted that academic failures occur on all intellectual levels, and a high IQ test score is no guarantee of school success.

### Academic Readiness and Task Persistence

American educators generally associate task persistence with academic success and distractibility with school failure. Research studies generally support this point of view (Gilmore, 1968; Packard, 1970; White 1967). Task persistence can be defined as a voluntary continuation of goal oriented behavior despite fatigue, discouragement or distractions (Mangan, 1959; McClintock, 1962). Coville et al. (1960) and Hutt (1969) differentiate task persistence from perserverations which are continuing repetitions of a specific behavior pattern after its utility has ceased. In the literature, task persistence and sustained attention are often used interchangeably.

Variables that promote task persistence. Kagan (1971) observed the highly variable intensity of stimulation that is often needed to attract infants' sustained attention and concluded that this implies some predisposition to attend to varying intensities of stimulations. Rubenstein (1967) studied the sustained attention of 44 infants 5 months of age who were classified as high, medium, and low attenders. The high attenders spent significantly more time looking, vocalizing, and manipulating objects, whereas the low attenders were engaged more in gross motor activities. Yarrow (1963) obtained similar results with adopted infants, in addition he found that boys have a higher activity level than girls. Kagan (1971) found that attention is governed by contrast and movement from birth to 9 weeks; and by novelty and rehearsal of past associations with the stimulus from 4 months to 2 years.

Although numerous studies have investigated the relationship of task persistence to factors generally associated with academic success, few studies suggest that persistence is the only predictor of academic achievement. Research with primarily college students is abundant in the literature; however there are only a few studies on task persistence in early childhood in the literature. Frye (1965) reported that task-oriented fourth grade students were significantly more likely to stay in the school building during recess to complete math tasks, and they demonstrated more concern about task results than non-task oriented fourth graders. Hunter et al. (1971) found that disabled readers had significantly lower attention concentration scores than normal readers in an age group ranging from 11 to 14 years of age.

Hunt (1961) reported that persistence of effort toward the completion of tasks started, and continuing persistence of effort to distant goals, probably depend upon children having experienced series of successes following increasing degrees of effort. In school-related tasks both Hieronymus (1951) and Keller (1963) found that boys from a low SES environment typically show much less persistence than do boys from middle class environments. Moreover, the children from low SES environments typically show substantially greater discrepancies between their actual performances on persistence test tasks and their professed levels of aspiration than do children from middle class environments.

Many educators believe that task persistence is an important skill for children to possess in order to resist distractions and attend to formal educational teachings (Cazden, 1968; Kohlberg, 1968; Maccoby, 1968). Research with elementary school children has confirmed that task persistence is generally related to academic achievement (Frye et al., 1965; Hall et al., 1968; Hunter et al., 1971). There was little research found in the literature on whether ethnic groups develop different task persistence.

Significance of others in task persistent behavior. Some studies imply that the adults in the environment are significant in determining children's capacities for, and utilization of task persistent behavior. Allen (1969) reported that fifth and sixth grade children would drop marbles in holes at a faster rate and for longer periods of time for a warm, supervising adult than a cold one. The same experimenter, Allen (1966) reported that preschool children persist longer when they have adult support and evaluation. Fifth grade students persist longer when work fails to meet their own self evaluation standards. This finding suggests that preschool children rely more on external support and feedback to continue tasks than do older children. Bee (1964) found that parents of task persistent children allow children to solve their own tasks while parents of non-task persistent children solve the tasks for their children. This finding agrees with Mandel (1968) who found that moderately nurturant environments are superior in promoting longer task persistence. Torrance (1969) found that early childhood subjects were more willing to remain with a difficult task when working with a partner.

Task persistence, a socioemotional variable, needs to be studied at the early childhood level to determine the magnitude of its impact upon academic achievement (Stephenson, 1974). Many factors, including ethnic group membership, need to be explored in order to determine environmental factors that might account for the development of task persistent behavior.

## Academic Readiness and Gender of Children

Most studies of early childhood automatically include the gender of children as a variable, with some sex differences usually found. Maccoby et al. (1974), in a study of sex differences development, gave priority to the early childhood years and included the largest proportion of studies in this age level. The fact that sex differences do appear in research studies has important methodological implications; these differences emphasize the importance of checking such differences before pooling data and of considering sex as a variable in studies of young children.

Sex differences in early childhood studies. Kagan et al. (1965) indicate the role of sex differences within the first year over a variety of infant behaviors. Schaeffer (1965) found behavioral sex differences as early as three weeks, and reported that parents can be active promulgators of sex role behavior through reinforcement of sex role appropriate responses within the first year of life.

Biller (1969) summarized studies of behavioral differences between boys and girls of preschool and early elementary school age. He concluded that girls of the same ages were more person oriented, more competent in verbal communication, more nurturant, polite, tactful, and neat whereas boys were more object oriented, more competent in physical activities, more aggressive and more achievement oriented than girls. Kohlberg (1966) found the majority of children by 3 years of age could properly identify themselves by sex; by age 4 they could label the sex of dolls correctly on the basis of clothes and hair styles; but that these children were between the ages of 5 and 7 before they formed a general concept of differences between the sexes.

Brophy et al. (1970) observed four first grade classrooms in a rural low SES environment, with an ethnic composition of 75% Anglo American; 15% Mexican American and 10% Afro American which was representative of the general population of the area. Teachers were asked to rank children in terms of achievement which was then used as the measure of teacher expectations for classroom performance. In each class, three boys and three girls high on the teachers' high list, and three boys and three girls low on the teachers' low list were selected for observational study. The goal of the study was to focus on differential treatment of different children. Sex effects appeared, with boys producing more correct answers and receiving more criticism than girls. Teachers were generally more consistently favoring the high achievers over the low achievers in demanding and reinforcing quality performance. The boys received more direct questions than the girls and were praised more frequently when giving correct answers. This is consistent with the general findings of the study: that boys tend to have more interactions of all kinds with the teacher than the girls.

Hetherington (1965) reminds researchers that most of the studies on father absence effects on young children, primarily boys, may be sketchy in interpretation because researchers often fail to consider the factors underlying the father separation from the family. Divorce, death, desertion, or career responsibilities may differentially affect the stress conflict in the home, as well as the mother's attitude toward the absent father.

Theories of sexual identification. Three theories of sexual identification are prevalent in the literature: (1) that of Freud's psychoanalytic theory, (2) social learning theory which is the focus of current research; this research has dealt with parental role expectations, reinforcements of stereotyped behaviors and attitudes by significant others, the influence of the media and culture in general on sex role identity and models, and (3) Kohlberg's cognitive development theory which hypothesized that children's basic sex role identity is largely the result of comprehension and acceptance of physical reality which is a concept formation, rather than a process determined by reinforcement and models.

There is an extensive body of research and articles relating to sexual identity and sex typing in educational, psychological, sociological, and medical journals and also in the journals of women's liberation and the popular press as the American society becomes more aware of sexual stereotypes. Dermy (1982) reported that there is more attention to sex differences in academic achievement as an issue in American culture than in other cultures.

## Summary of Review of the Literature

The review of the literature investigated: (1) the concept of academic readiness and included the influence of language proficiency and low SES environment on its development, and (2) factors used in the study which contribute to academic readiness, including chronological age, general knowledge, intelligence, persistence, and gender of the ethnically diverse student.

The relationship between academic readiness and reading readiness in the early years in the United States school system seems to be clear in the literature. Research studies also point to the importance of language proficiency in achieving success in school. Non-English speaking immigrant children, proficient in their home languages yet lacking proficiency in their English language could easily be underclassified by English speaking teachers in their predictions of non-English speaking (NES) children's abilities to learn in United States schools.

Many studies reviewed grouped all lower socioeconomic level children together without regard to ethnic, cultural, or economic differences. Some studies assumed that all poor children had the same needs instead of viewing "disadvantaged" children as a heterogeneous group with a variety of needs. Research showed that low SES children have a vast range of intellectual and social competencies. Some writers argued that the problems of the poor are located in the institutions of our society that perpetuate educational inequality.

Educational opportunity as a way out of poverty was oversimplified in view of the complex social problems in United States society.

Five different factors which contribute to prediction of academic readiness in ethnically diverse 4 and 5 year old children were isolated for review as single predictors, yet interaction between and among predictors is a general assumption in the literature.

Chronological age admission standard has progressively been lowered for entrance to United States public schools, with beginning of formal instruction and teaching of reading in some instances in the kindergarten. Determination of chronological age for children from other cultures was reviewed. Anthropologists pointed out that the chronological age of children from other societies or countries may be determined differently from those in the United States. Studies showed (regarding the effects of chronological age at the time of entering USA schools on later achievement) that school entry chronological age is not a highly significant factor on later achievement but that mental age must also be determined.

General knowledge, defined as the concepts and skills acquired from the environment during the years before school entry, appeared to be related to attendance in preschool intervention programs; these programs appeared to produce gains in cognitive development although some researchers felt that intervention programs before public school entry were effective.

Various studies cautioned against placing too great an emphasis upon intelligence as the major factor in academic readiness, while other studies showed mental age scores to be closely related to academic readiness. According to Klausmeier et al. (1975) the concept of the organization of intellectual abilities appears to have followed a progression--from one general intellectual ability to a few primary mental abilities, to many specific abilities, to a large and undetermined number of highly specific skills. At the present time, there appears to be the acceptance of a hierarchical structure which involves a general ability that underlies any performances, a few less general abilities associated with several kinds of performances, and specific abilities which are related to specific performances.

Task persistence studies which used early childhood subjects were sparse in the literature. In contrast, persistence achievement research with older subjects was quite extensive. Although strongly suggesting that persistence and achievement were positively related, the findings did not imply that persistence was the only predictor of achievement.

A number of studies suggested that the recognition of sex differences begins very early in children's lives. Childrearing practices appeared to be important variables in how both sexes responded to academic achievement, with the United States culture making sex differences more of an issue. Recent research on sex differences seemed to favor girls at the 4 to 5 year old level on readiness for academic learning.

The research reviewed showed that academic readiness appears to be related to language and SES factors, and that there appears also to be positive relationships between academic readiness and the variables used in this study, i.e., chronological age, general knowledge, intelligence, persistence, and gender of ethnically diverse 4 and 5 year old children.

# CHAPTER III

# METHODOLOGY

## Introduction

This study analyzed the influence of selected variables on academic readiness of low income 4 and 5 year old, Anglo, Mexican, and Vietnamese children eligible for kindergarten in the school year 1981-1982. Permission to conduct this educational research project was granted in the spring of 1981 by the Denver Public Schools. The Denver Public Schools Department of Educational Data Systems and Research reviewed the need for the study, the design, the relevance for low income ethnically diverse children, the procedures to be followed, and approval was given to carry out the study.

The study centered on an investigation of variables which would be useful in the prediction of academic readiness in 4 and 5 year old ethnically diverse students at the beginning of their kindergarten year. The major procedural steps of the study were:

1. To visit the children's homes to obtain the data for the independent variables and the criterion variable by the means of the administration of four instruments. When appropriate, the directions were interpreted into the children's dominant languages.

2. To investigate the predictiveness of these factors singly and in combination with each other for each of the ethnic groups of the study, and

3. To compare the means of all test variables across ethnically diverse groups.

In order to study the influence of the independent variables on academic readiness, the following procedures were implemented:

1. The variables were operationally defined
2. Hypotheses to be tested were stated in null form
3. Subjects were selected
4. Interpreters were selected
5. Parental permissions were obtained
6. Data were collected
7. Statistical analysis procedures were selected
8. Data were analyzed

## The Variables Operationally Defined

The variables in this research were the independent variables of chronological age in months, general knowledge, intelligence, persistence, persistence to completion, and gender of the ethnically diverse students. The dependent variable was academic readiness.

### Independent Variable: Chronological Age in Months

Records from the Denver Public Schools, Office of Pupil Enrollment were used to gather these data. As discussed in Chapter II, children born into other societies may have had their ages reported in different ways from American or western societies; therefore their ages may not be precise in terms of years and months. Nevertheless, according to Denver Public School records, children in this study are 56 to 71 months in age.

### Independent Variable: General Knowledge

Scores on the Cooperative Preschool Inventory (CPSI) were used as an independent variable, which measured the general knowledge of ethnically diverse children. Drawn from the works of Betty Caldwell (1980) it was reported that the CPSI had been used with such diverse ethnic groups as American Indian children, Spanish surnamed children, and large numbers of racially mixed children in Hawaii. In addition, the instrument had been used in Jamica, and was translated into Yoruba for use as a school skills inventory in Nigeria. She stated further that the translation of the CPSI into other languages, appears to be possible with only minimal disruption of the scale's pattern of psychometric performance.

Caldwell developed this instrument to provide an indication of how much a child had achieved in areas regarded as important for subsequent success in public schools. She standardized the CPSI on lower SES children in the south. It is published by Addison Wesley Publishing Company with directions in English and Spanish, and is purported to measure knowledge in language, mathematics, and reasoning skills. The national norms were based on children enrolled in 11 Head Start centers.

The revised edition of the CPSI contains 64 items scored as correct or incorrect. K-R 20 reliability coefficients for age groups

3.0 to 6.5 range from .86 to .92. For the total standardization sample, the mean increases about four raw points from one age group to another. The standard error of measurement for the age groups varies from 3.1 to 3.9. The Stanford Binet was used with 1,476 subjects during the standardization procedure. Concurrent validity coefficients vary from .39 at age 3-0 to 3-11 to .65 at age 5-0 to 5-5.

Caldwell attempted to determine whether the standard error of measurement on the CPSI was reasonably consistent across different populations and further computed the standard errors of measurement from data on 654 ethnically diverse kindergarten children living in New Jersey. This sample consisted of white, Black, and Puerto Rican children; the standard errors of measurement were 2.3; 3.1; and 4.5, respectively, suggesting there is a slightly greater margin of error when the test is administered to non-white (Puerto Rican) children. However, when all three subsamples were considered together, the standard error of measurement was 3.4; this measurement is consistent with the original sample.

## Independent Variable: Intelligence

The Guide for Administering and Interpreting the Columbia Mental Maturity Scale (CMMS) (1972) states that the test measures general reasoning ability; this reasoning ability includes both simpler classification tasks as well as higher level abstract manipulation of symbolic concepts. In addition, since this instrument does not depend upon language skills, it appeared to be particularly appropriate for children who do not speak the English language. The guide also stresses that the general reasoning abilities which are measured are those especially important for school success.

The Columbia Mental Maturity Scale (CMMS) third edition, was developed by Burgemeister et al. in 1972. It provides for the evaluation of reasoning ability through the use of non-verbal stimuli, i.e., picture cards in which the child selects one drawing on each of 92 cards that is different from the others.

The standardization procedure included 2,600 children from 25 states. Representative of a national sample on the variables of geographic region, race, parental occupation, age and sex. The split half reliabilities from each age group range from .85 to .91 with a median of .88 indicating excellent internal consistency. Median test retest reliability, 7 to 10 days apart for three different age groups, was .85. These data suggest that the scale is quite reliable. The validity data consist of correlations ranging from .31 to .61 between the CMMS and scores from a standardized achievement test. The concurrent validity using the Stanford Binet as the criterion with below average children is .71.

The CMMS provides age deviation scores which range from 50 to 150 with a mean of 100 and a standard deviation of 16. The standard error of measurement is 5 points for ages 3.5 through 5.5 years and 6 points for ages 5.6 through 9.5 years. This instrument was recommended by Kluever (1982) in a personal communication.

## Independent Variable: Persistence

Scores obtained from the Michigan State University Puzzle Box (MSU) were used as a measure of task persistence. This puzzle looks as though it can be easily solved but it is actually quite difficult. Robert Boger of the Institute for Family and Child Studies at Michigan State University stated in a telephone interview with this researcher that this measure of persistence was adapted from Thomas Banta's test of persistence in the Cincinnati Autonomy Test Battery and had not been standardized. The puzzle box, often called "the replacement puzzle," is itself an adaptation of a test developed by Keister in 1943.

The emphasis of the puzzle task is on how involved the child becomes in attaining a solution, i.e., his or her task persistence. This persistence is measured in terms of time spent working on the puzzle. Observations are every 20 seconds, with a total persistence score of 15 possible during a 5 minute time period. The scores range from 0 to 15. Since the ultimate goal of the task is satisfactory completion of the puzzle, when children are able to solve the puzzle in less than 5 minutes they are given the total score of 15. This implies that a sequence of behaviors needed for successful completion of the task was present in the child and the child persisted long enough to complete the task.

## Independent Variable: Persistence to Completion

Persistence to completion is a nominal variable of completion or non-completion of the MSU puzzle task.

## Independent Variable: Gender of Child

Records from the Denver Public Schools Office of Pupil Enrollment were used to gather the gender of each child in the study.

## Dependent Variable: Academic Readiness

The criterion variable of academic readiness was measured by the Metropolitan Readiness Test (MRT) published by the Psychological Corporation. This test predicts success in school through a total readiness score. The assumption underlying this readiness test is that the present level of performance is the best predictor of future achievement. The total score was used in this study because the manual advises against the interpretation of each subtest. The Harry Singer Review in volume 11 of Buros' Seventh Mental Measurements Yearbook (1978) suggests that teachers should be aware that bilingual children are likely to be handicapped on the test even when given in the other language, because, in his opinion, bilingual children tend to be deficient in both languages. He also stated that low socioeconomic status is associated with less reliable scores on the test. Nurss et al. revised the MRT in 1976. In this study level one of the MRT was used to predict kindergarten academic readiness, since it is intended for use with children in the beginning of kindergarten.

The MRT is a norm referenced, multiple skill battery intended to assess several important skills needed for early school success such as the child's readiness for reading as well as other areas of school achievement. The subtests, except copying, which is an optional test, employ a multiple choice format. Level one contains six subtests of auditory memory, rhyming, letter recognition, visual matching, school language and listening, and quantitative language. The test is untimed, and raw scores for each of the subtests is summed to get the total raw score called prereading skills.

Sixty-six thousand children participated in the standardization program. Sex of students, geographic and ethnic data, as well as data indicating prior educational experience are presented for level one in the teacher's manual.

Split half reliability estimates corrected by the Spearman Brown formula, KR-10 estimates of internal consistency and alternate form reliability for the prereading composite are .93, .92, and .85, respectively. Nurss et al. (1976) stated that the content of the test was familiar to all kindergarten and first grade pupils regardless of sex, ethnic background, urban/rural residence, socioeconomic status or geographic region. Minority consultants screened test items and deleted items with possible ethnic bias. The predictive validity was established by correlating the MRT scores in the fall with achievement scores of Metropolitan Achievement Tests in the spring. The prereading composite had a correlation of approximately .70 with both total reading and total mathematic achievement scores.

## Statement of the Null Hypotheses

The research hypotheses of the study were exploratory in nature. They were designed to examine relationships between the independent variables and dependent variable for each ethnically diverse group in order to get the best possible prediction equation for each group, and to compare ethnically diverse group means on all of the instruments. The study was designed to explore factors which appear to contribute to academic readiness in ethnically diverse 4 and 5 year old children in order to provide directions of promise for more specific future investigations.

The hypotheses were:

1. There is no significant relationship between chronological age in months and academic readiness for:
    a. the total group
    b. boys
    c. girls
    d. Anglo students
    e. Mexican students, and
    f. Vietnamese students

    in the study.
2. There is no significant relationship between general knowledge and academic readiness for:
    a. the total group
    b. boys
    c. girls

d. Anglo students

e. Mexican students, and

f. Vietnamese students

in the study.

3. There is no significant relationship between intelligence and academic readiness for:

    a. the total group

    b. boys

    c. girls

    d. Anglo students

    e. Mexican students, and

    f. Vietnamese students

    in the study.

4. There is no significant relationship between persistence and academic readiness for:

    a. the total group

    b. boys

    c. girls

    d. Anglo students

    e. Mexican students, and

    f. Vietnamese students

    in the study.

5. There is no difference in the combination of predictor variables of academic readiness among ES Anglo, NES Mexican, and NES Vietnamese students in the multiple regression equation.

6. There is no significant difference in general knowledge scores among ES Anglo, NES Mexican or NES Vietnamese students when age in months is used as a covariate, and sex is used as a blocking variable.
7. There is no significant difference in intelligence scores among ES Anglo, NES Mexican, or NES Vietnamese students when age in months is used as a covariate, and sex is used as a blocking variable.
8. There is no significant difference in persistence scores among ES Anglo, NES Mexican or NES Vietnamese students when age in months is used as a covariate, and sex is used as a blocking variable.
9. There is no significant difference in academic readiness scores among ES Anglo, NES Mexican or NES Vietnamese students when age in months is used as a covariate, and sex is used as a blocking variable.
10. There is no significant difference in proportions of ES Anglo, NES Mexican or NES Vietnamese students who persist to completion on the MSU Puzzle Box Test.

## Subjects

### Population and Sampling

Four and 5 year old Anglo, Mexican and Vietnamese children eligible for kindergarten in the Denver Public Schools were the subjects of this study. The students were drawn from lists of children located in the Denver Public Schools Department of Pupil Records and lists of students located in the Department of Evaluation. From these lists, low SES level was determined on the basis of head of household major occupation groups used by the Census Bureau (1960) and were limited to the classification of blue collar workers, service workers, and unemployed Welfare recipients.

From this list of low SES students, groups of ethnic affiliations were compiled. These included English speaking white non Lau category children, Mexican speaking children Lau categories A and B, and Vietnamese speaking children Lau categories A and B. Lau A category includes all children who speak and understand only a language other than English; Lau B category includes all children who speak and understand mostly a language other than English. This list was then further subdivided into ES Anglo boys and girls, NES Mexican boys and girls, and NES Vietnamese boys and girls.

Through random assignment of children from a book of random numbers, 10 boys and 10 girls were assigned to each ethnic group making a total of 20 subjects in each ethnic group and a grand total sample of 60 students for the study.

## Interpreters

Interpreters were recommended by the Bilingual Department of the Denver Public Schools as educators able to interpret the directions of tests to non-English speaking Mexican and non-English speaking Vietnamese students. Since intonation patterns vary among populations, the interpreters selected were native speaking persons from the same cultural population as the child. One Mexican educator and one

Vietnamese educator were selected on the basis of availability during the testing time selected in August 1982, willingness to participate in the study, and recommendations from two Denver Public School educators. The interpreters worked on alternate days during the month of August 1982 from 8:00 in the morning to as late as 5:00 p.m.

## Parental Permission Letters

Letters for permission to test children designated for the study were obtained from the Bilingual Department of the Denver Public Schools in the languages of English, Spanish and Vietnamese. Copies of the letters are shown in the Appendix.

## Collection of Data

The actual testing of children was done in the child's home with a member or members of the child's family, the interpreter, and the researcher present during the testing. The purpose of the testing was verbally stated, and parents signed the permission slips before the testing began. Contacts were made by telephone to arrange for scheduling of testing when possible; however, generally the interpreters and this researcher visited the homes of children living in low SES areas of the city. Since many of the low SES families did not have telephones, visiting their homes was the most feasible solution to discussing the study with parents. In the majority of instances, the families suggested the testing be done right then, although a few parents set an appointment for the researcher to return at a more convenient time. Since none of the tests were timed, the time involved in the administration of the tests lasted from 40 minutes to over one hour. During this time, the child was able to stop and relax and then later continue the task at hand. The order in which the tests were given was randomly selected so no one instrument was administered first each time. Sessions were begun on August 2, 1982 and ended on August 27, 1982 for a total of 20 days of testing in 60 different homes of the children involved in the study.

## Statistical Design

The SPSS Statistical Package was used in this study. The Pearson Product-Moment Correlation was selected to test null hypotheses 1 through 4. The stepwise multiple regression procedure was selected to test hypothesis 5. The two way analysis of covariance (ANCOVA) with a block on sex and a covariate of age in months of students was selected to test hypotheses 6 through 9. Cross Tabulation, chi-square was used to test hypothesis 10 (differences in persistence to completion proportions among ethnically diverse groups) because of the nominal data gathered in the persistence to completion test.

## Report of Results

Findings of the study, reported in narrative and tabular form are included in Chapter IV. In Chapter V, findings are summarized, and conclusions drawn relative to the academic readiness of ethnically diverse students, and to the importance of specific factors relative to academic readiness. Recommendations are also offered for the direction of programs to promote academic readiness in ethnically diverse students, and for further research.

# CHAPTER IV

## FINDINGS AND DISCUSSION

The purpose of this chapter is to present the result of analysis of data obtained in the study and to discuss the findings.

The first null hypothesis, there is no significant correlation between chronological age in months and academic readiness for: (1) the total group, (2) boys, (3) girls, (4) ES Anglo students, (5) NES Mexican students, and (6) NES Vietnamese students in the study was found to be tenable. The data in Table 1 show that there was no significant correlation for the total group; the boys, the girls, the ES Anglo students, the NES Mexican students, or the NES Vietnamese students.

The second null hypothesis, there is no significant correlation between general knowledge and academic readiness for: (1) the total group, (2) boys, (3) girls, (4) ES Anglo students, (5) NES Mexican students, or (6) NES Vietnamese students in the study was rejected for all groups except the NES Vietnamese students, where it was found to be tenable.

The data in Table 1 show that the test of general knowledge proved to be significant at the .01 level for the total group, ES

## Table 1

### Pearson Correlation Coefficients Between Independent Predictors and Criterion Variable

| | N | Cooperative Preschool Inventory | Columbia Mental Maturity Scale | Michigan State University Puzzle Box | Age |
|---|---|---|---|---|---|
| Total Group | 60 | 0.4848** | 0.5822** | 0.5063** | 0.1191 |
| Boys | 30 | 0.4847** | 0.5920** | 0.5347** | 0.1367 |
| Girls | 30 | 0.5421** | 0.5915** | 0.5041** | 0.0759 |
| Anglo Students | 20 | 0.5410** | 0.5692** | 0.7002** | 0.1321 |
| Mexican Students | 20 | 0.4203* | 0.4943* | 0.5192** | 0.1679 |
| Vietnamese Students | 20 | 0.3695 | 0.7238** | 0.4148* | 0.0411 |

*$p < .05$
**$p < .01$

Anglo students, boys and girls. It proved to be significant at the .05 level for the NES Mexican students, and not significant for the Vietnamese students.

The third null hypothesis, there is no significant correlation between intelligence and academic readiness for: (1) the total group, (2) boys, (3) girls, (4) ES Anglo students, (5) NES Mexican students, and (6) NES Vietnamese students, was rejected for all groups in the study at the .01 level except for the Mexican students. The correlation was significant at the .05 level for the Mexican students, as shown in Table 1.

The fourth null hypothesis, there is no significant correlation between persistence and academic readiness for: (1) the total group, (2) boys, (3) girls, (4) ES Anglo students, (5) NES Mexican students, and (6) NES Vietnamese students in the study was rejected for all groups at the .01 level with the exception of the Vietnamese students in which case the hypothesis was rejected at the .05 level as shown in Table 1. The fifth hypothesis, there is no difference in the combination of predictor variables of academic readiness among ES Anglo, NES Mexican, and NES Vietnamese students in the multiple regression equation was shown to be false as can be seen in Table 2.

The Michigan State University Puzzle Box emerged as the sole predictor variable for both the ES Anglo and NES Mexican students at the .01 and .05 level, respectively whereas the Columbia Mental Maturity Scale (CMMS) emerged in the regression equation as the

Table 2

F Levels of Predictor Variables for Ethnically Diverse Groups and Total Group Included in the Prediction Equations

| Groups | Cooperative Preschool Inventory | Columbia Mental Maturity Scale | Michigan State University Puzzle Box |
|---|---|---|---|
| ES Anglo | NS | NS | 17.31** |
| NES Mexican | NS | NS | 6.64* |
| NES Vietnamese | NS | 19.81** | NS |
| Total Group | 4.917* | 14.648** | NS |

NS = Non Significant
 *p < .05
**p < .01

sole predictor for the NES Vietnamese students at the .01 level of significance.

The sixth null hypothesis, there is no significant difference in general knowledge scores between ES Anglo, NES Mexican, or NES Vietnamese students when age in months is used as a covariate, and sex is used as a blocking variable was found to be tenable as shown in Table 3. Neither the main effects of ethnicity nor sex were significant at the .05 level (Ethnicity $p = 0.063$; Sex $p = 0.704$).

The seventh null hypothesis, there is no significant difference in intelligence scores between ES Anglo, NES Mexican, or NES Vietnamese students when age in months is used as a covariate and sex is used as a blocking variable was found to be tenable as shown in Table 4. Neither ethnicity nor sex were significant at the .05 level (Ethnicity $p = 0.955$; Sex $p = 0.806$).

The eighth null hypothesis, there is no significant difference in persistence scores between ES Anglo, NES Mexican, or NES Vietnamese students when age in months is used as a covariate, and sex is used as a blocking variable was found to be tenable. Neither the main effects of ethnicity nor sex were significant at the .05 level of significance as shown in Table 5 (Ethnicity $p = 0.436$; Sex $p = 0.940$).

The ninth null hypothesis, there is no significant difference in academic readiness scores among the ES Anglo, NES Mexican, or NES Vietnamese students when age in months is used as a covariate, and sex is used as a blocking variable was found to be tenable. Neither

## Table 3

### ANCOVA: Cooperative Preschool Inventory by Ethnicity, by Sex, with Covariate Age in Months

| Source of Variation | Sum of Squares | DF | Mean Square | F | Significance of F |
|---|---|---|---|---|---|
| Covariates--Age | 4.212 | 1 | 4.212 | 0.091 | 0.765 |
| Main Effects | 279.266 | 3 | 93.089 | 2.001 | 0.125 |
| Ethnic | 271.476 | 2 | 135.738 | 2.918 | 0.063 |
| Sex | 6.772 | 1 | 6.772 | 0.146 | 0.704 |
| 2-Way Interactions--Ethnic, Sex | 246.545 | 2 | 123.272 | 2.650 | 0.080 |
| Explained | 530.023 | 6 | 88.337 | 1.899 | 0.098 |
| Residual | 2465.577 | 53 | 46.520 | | |
| Total | 2995.600 | 59 | 50.773 | | |

Table 4

ANCOVA: Columbia Mental Maturity Scale by Ethnicity, by Sex, with Covariate Age in Months

| Source of Variation | Sum of Squares | DF | Mean Square | F | Significance of F |
|---|---|---|---|---|---|
| Covariates--Age | 60.182 | 1 | 60.182 | 0.453 | 0.504 |
| Main Effects | 20.483 | 3 | 6.828 | 0.051 | 0.984 |
| Ethnic | 12.154 | 2 | 6.077 | 0.046 | 0.955 |
| Sex | 8.111 | 1 | 8.111 | 0.061 | 0.806 |
| 2-Way Interactions--Ethnic, Sex | 24.731 | 2 | 12.365 | 0.093 | 0.911 |
| Explained | 105.395 | 6 | 17.566 | 0.132 | 0.992 |
| Residual | 7041.538 | 53 | 132.859 | | |
| Total | 7146.933 | 59 | 121.134 | | |

## Table 5

ANCOVA: Michigan State University Puzzle Box by Ethnicity, by Sex, with Covariate Age in Months

| Source of Variation | Sum of Squares | DF | Mean Square | F | Significance of F |
|---|---|---|---|---|---|
| Covariates--Age | 0.012 | 1 | 0.012 | 0.001 | 0.978 |
| Main Effects | 25.739 | 3 | 8.580 | 0.565 | 0.640 |
| Ethnic | 25.596 | 2 | 12.798 | 0.843 | 0.436 |
| Sex | 0.086 | 1 | 0.086 | 0.006 | 0.940 |
| 2-Way Interactions--Ethnic, Sex | 6.596 | 2 | 3.298 | 0.217 | 0.805 |
| Explained | 32.347 | 6 | 5.391 | 0.355 | 0.904 |
| Residual | 804.503 | 53 | 15.179 | | |
| Total | 836.850 | 59 | 14.184 | | |

the main effects of ethnicity nor sex were significant at the .05 level of significance as shown in Table 6 (Ethnicity $p = 0.051$; Sex $p = 0.144$).

The tenth null hypothesis, there is no significant difference in proportion of ES Anglo, NES Mexican, or NES Vietnamese students who persist to completion on the Michigan State University Puzzle Box test was rejected at the .05 level of significance, as shown in Table 7 ($X^2 = 14.33715$, $p = 0.0008$).

As shown in Table 8, the multiple correlations of the predictor variables with the Metropolitan Readiness Test range from .519 to .72 for the ethnically diverse groups of the study. The coefficients of multiple determination, or total variance explained in the criterion, range from 27% to 52% of the total. The largest R of the ethnically diverse groups occurred for the NES Vietnamese students ($R = .72$) accounting for 52% of the variance in academic readiness scores.

## Discussion of Findings

Each hypothesis stated in null form was tested against a level of significance of .05 or less. Hypotheses 1 through 4 were concerned with the significance of correlations between the predictor variables and the criterion variable. Inspection of the data indicated that all of the predictor variables were positively correlated with the criterion variable, at the .05 level with the exceptions of age for all groups and the correlation between general knowledge and academic

## Table 6

ANCOVA: Metropolitan Readiness Test by Ethnicity, by Sex, with Covariate Age in Months

| Source of Variation | Sum of Squares | DF | Mean Square | F | Significance of F |
|---|---|---|---|---|---|
| Covariates--Age | 105.158 | 1 | 105.158 | 0.932 | 0.339 |
| Main Effects | 954.717 | 3 | 318.239 | 2.820 | 0.048 |
| Ethnic | 710.875 | 2 | 355.438 | 3.150 | 0.051 |
| Sex | 247.664 | 1 | 247.664 | 2.195 | 0.144 |
| 2-Way Interactions--<br>Ethnic, Sex | 375.410 | 2 | 187.705 | 1.663 | 0.199 |
| Explained | 1435.285 | 6 | 239.214 | 2.120 | 0.066 |
| Residual | 5980.448 | 53 | 112.839 | | |
| Total | 7415.733 | 59 | 125.690 | | |

Table 7

Chi-Square: Persistence to Completion by Ethnicity

| Completion | | 1<br>Anglo | 2<br>Mexican American | 3<br>Vietnamese | Total |
|---|---|---|---|---|---|
| No | Count | 19 | 18 | 10 | 47 |
| | Row Percentage | 40.4 | 38.3 | 21.3 | 78.3 |
| | Column Percentage | 95.0 | 90.0 | 50.0 | |
| | Total Percentage | 31.7 | 30.0 | 16.7 | |
| Yes | Count | 1 | 2 | 10 | 13 |
| | Row Percentage | 7.7 | 15.4 | 76.9 | 21.7 |
| | Column Percentage | 5.0 | 10.0 | 50.0 | |
| | Total Percentage | 1.7 | 3.3 | 16.7 | |
| | Column | 20 | 20 | 20 | 60 |
| | Total | 33.3 | 33.3 | 33.3 | 100.0 |

Chi-square = 14.33715
Degrees of Freedom = 2
Significance = 0.0008

Table 8

Multiple Correlations and Coefficients of Multiple Determination of Metropolitan Readiness Test with Predictor Variables for Ethnically Diverse Groups

| Ethnically Diverse Groups | $R^2$* | R |
|---|---|---|
| English Speaking Anglo Ethnicity | .49 | .70 |
| Non-English Speaking Mexican Ethnicity | .27 | .52 |
| Non-English Speaking Vietnamese Ethnicity | .52 | .72 |

*Coefficient of Multiple Determination.

readiness for the NES Vietnamese students. These data indicate the appropriateness of the instruments selected for predicting academic readiness for the ethnically diverse students in the study. Pearson coefficients for the Anglo, Mexican, and Vietnamese are shown in Tables 9, 10, and 11, respectively.

Hypothesis 5 was concerned with the multiple regression equations. In this study a level of .05 was set as the prescribed significance to be met in order for a variable to be included in the multiple regression equation. For the ES Anglo student, the F level of the test of persistence (MSU) was highly significant at the .01 level. In the case of the NES Mexican student, the MSU test of persistence also was significant at the .05 level of significance. However in the case of the NES Vietnamese student, the intelligence test (CMMS) proved to be the only significant predictor. In all three ethnically diverse groups, only one test was included in each multiple regression equation as no other test added significantly beyond the single test selected by the stepwise regression analysis. However, in a stepwise regression analysis for the total group two tests were included as significant at the .05 level, namely the test of intelligence (CMMS), significant at the .01 level and the test of general knowledge (CPSI), significant at the .05 level. This analysis points to the importance of finding instruments that are appropriate for ethnically diverse groups instead of considering only instruments appropriate for the total group.

Table 9

Anglo Ethnicity: Pearson Coefficients
(N = 20)

| | Metropolitan Readiness | Cooperative Preschool Inventory | Columbia Mental Maturity Scale | Michigan State University Test of Persistence | Age |
|---|---|---|---|---|---|
| Metropolitan Readiness | 1.00000 | 0.54100 | 0.56922 | 0.70021 | 0.13205 |
| Cooperative Preschool Inventory | 0.54100 | 1.00000 | 0.62956 | 0.72610 | -0.05695 |
| Columbia Mental Maturity Scale | 0.56922 | 0.62956 | 1.00000 | 0.71621 | 0.17927 |
| Michigan State University Test of Persistence | 0.70021 | 0.72610 | 0.71621 | 1.00000 | -0.10949 |
| Age | 0.13205 | -0.05695 | 0.17927 | -0.10949 | 1.00000 |

Table 10

Mexican Ethnicity: Pearson Coefficients
(N = 20)

| | Metropolitan Readiness | Cooperative Preschool Inventory | Columbia Mental Maturity Scale | Michigan State University Test of Persistence | Age |
|---|---|---|---|---|---|
| Metropolitan Readiness | 1.00000 | 0.42026 | 0.49426 | 0.51922 | 0.16792 |
| Cooperative Preschool Inventory | 0.42026 | 1.00000 | 0.55746 | 0.53871 | 0.30262 |
| Columbia Mental Maturity Scale | 0.49426 | 0.55746 | 1.00000 | 0.60154 | 0.09579 |
| Michigan State University Test of Persistence | 0.51922 | 0.53871 | 0.60154 | 1.00000 | 0.10320 |
| Age | 0.16792 | 0.30262 | 0.09579 | 0.10320 | 1.00000 |

## Table 11

Vietnamese Ethnicity: Pearson Coefficients
(N = 20)

| | Metropolitan Readiness | Cooperate Preschool Inventory | Columbia Mental Maturity Scale | Michigan State University Test of Persistence | Age |
|---|---|---|---|---|---|
| Metropolitan Readiness | 1.00000 | 0.36947 | 0.72383 | 0.41484 | 0.04109 |
| Cooperative Preschool Inventory | 0.36947 | 1.00000 | 0.35643 | 0.75269 | -0.18574 |
| Columbia Mental Maturity Scale | 0.72383 | 0.35643 | 1.00000 | 0.45080 | 0.01648 |
| Michigan State University Test of Persistence | 0.41484 | 0.75269 | 0.45080 | 1.00000 | 0.10413 |
| Age | 0.04109 | -0.18574 | 0.01648 | 0.10413 | 1.00000 |

The purpose of the multiple regression equation is to facilitate the prediction for individual subjects using the composite set of predictors. The formulae for multiple regression equations for ethnically diverse groups in this study are shown in Table 12.

Anyone interested in employing these equations can expect a prediction that approximates the multiple correlations derived in this study for the ethnically diverse groups involved. The scores on the individual tests need only to be inserted in the appropriate regression equations. These scores are multiplied by the specified coefficient, and then added to a constant to arrive at a predicted score. Since the tests were administered in this study at the beginning of kindergarten, the predicted scores should be interpreted as of this point in time. Examples of the use of the multiple regression equations using randomly selected subjects with the test of persistence (MSU) for the Anglo and the NES Mexican students, and the test of intelligence (CMMS) for the NES Vietnamese students are shown in the Appendix.

The multiple correlation is subject to a similar interpretation, as to size and importance, as are Pearson correlations. As shown in Table 8 the multiple correlations of the predictor variables with the Metropolitan Readiness Test range from .52 to .72 for the ethnically diverse groups of the study.

The multiple correlation squared, or the coefficient of multiple determination, indicates the proportion of variance in the criterion variable that is dependent upon, or associated with the regression

Table 12

Formulae for Multiple Regression Equations

---

Anglo Students

Predicted Metropolitan Readiness Score =

$$1.896579(\text{MSU}) + 28.7049$$

Mexican Students

Predicted Metropolitan Readiness Score =

$$1.631818(\text{MSU}) + 22.1818$$

Vietnamese Students

Predicted Metropolitan Readiness Score =

$$0.7256210(\text{CMMS}) - 30.05359$$

weights employed. Specifically, the coefficient of multiple determination denotes in the study the percentage of variance in academic readiness that was accounted for by what was measured by the tests.

The coefficients of multiple determination or total variance explained in the criterion, range from 27% to 52% of the total. Therefore, academic readiness for low SES ES Anglo, NES Mexican, and NES Vietnamese students can be predicted from test scores secured at the beginning of the kindergarten year using the instruments of this study. The largest R of the ethnically diverse groups occurred for the NES Vietnamese students (R = .72).

Hypotheses 6 through 9 compared the means of the predictor variables and the criterion test for the three ethnic groups in the study. These data are presented in Table 13. The differences among the means of tests were tested by an analysis of covariance at the .05 level of significance using age in months as the covariate and sex as a blocking variable. There were no significant differences among ethnically diverse groups on any of the test variables of the study, showing that if tests are made English Language Independent, there are few ethnic differences in test results.

Hypothesis 10 was tested using a chi-square cross tabulation of persistence to completion by ethnicity. The results showed that there was a significant difference among the ethnically diverse groups on this variable. A percentage tabulation showed this difference to be between the NES Vietnamese and the other ethnic groups of students (Figure 1).

Table 13

Group Comparison of Means Among Predictor and Criterion Variables

| Variables | Anglo<br>(N = 20)<br>Ethnicity | Mexican<br>(N = 20)<br>Ethnicity | Vietnamese<br>(N = 20)<br>Ethnicity |
|---|---|---|---|
| Metropolitan Readiness | 48.05 | 39.50 | 44.25 |
| Cooperative Preschool Inventory | 54.75 | 49.70 | 50.95 |
| Columbia Mental Maturity Scale | 102.40 | 101.60 | 102.40 |
| Michigan State University Persistence Test | 10.20 | 10.00 | 11.45 |
| Age | 65.45 | 64.85 | 63.80 |

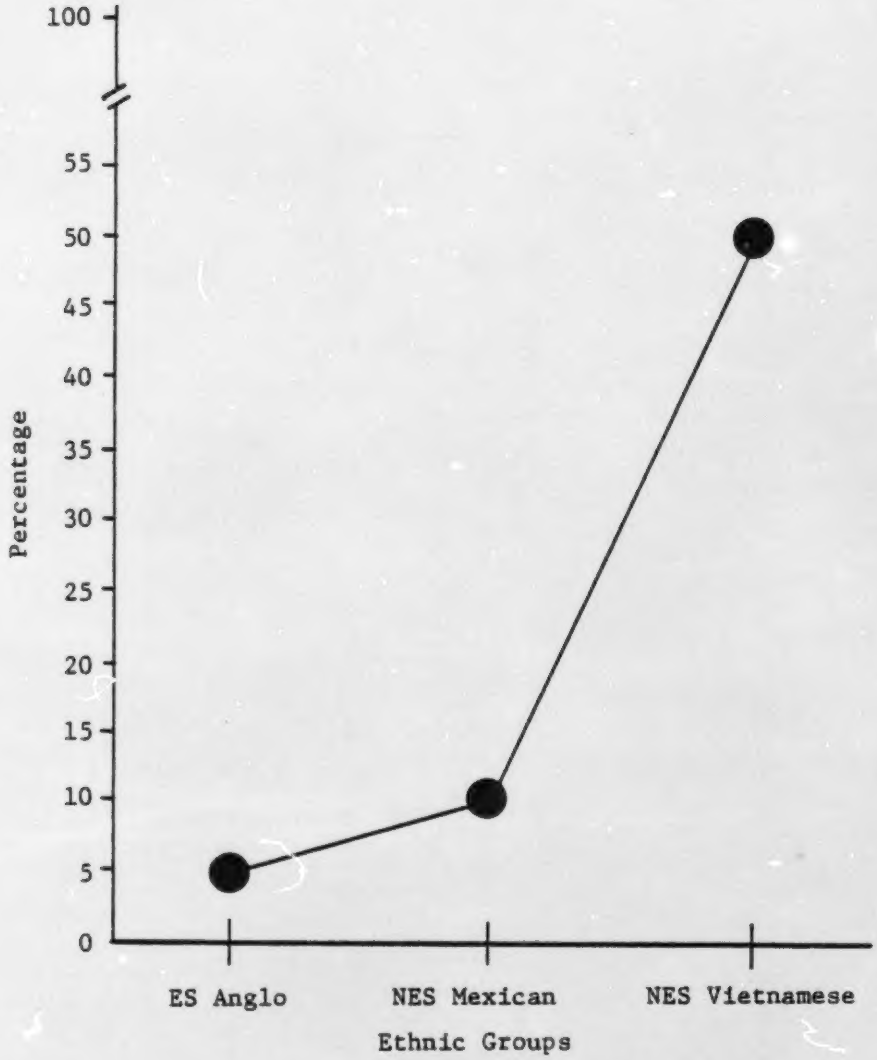

Figure 1. Percent of Subjects Completing the Persistence Task for Three Ethnically Diverse Groups (ES Anglo, NES Mexican, NES Vietnamese)

# CHAPTER V

## SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The purposes of this chapter are to summarize the findings of this study, to draw conclusions based on those findings, and to make recommendations. The recommendations will be pertinent to the problem of predicting academic readiness in ethnically diverse 4 and 5 year old students (some of whom do not speak or understand the English language) through using instruments made English language independent by the use of interpreters.

### Summary

The intent of this explorative study was: (1) to investigate the effectiveness of certain English language predictors of academic readiness of ethnically diverse 4 and 5 year old children as well as to determine which composite of these predictors was most reliable in predicting academic readiness, and (2) to compare these results among various ethnically diverse groups of children.

The following hypotheses were formulated and investigated by statistical analysis of the data collected:

1. The relationship between each predictor test and the criterion variable (academic readiness) will be significant, yet the prediction formula will vary according to ethnic group membership.

2. The ethnically diverse groups tested will not differ significantly on any of the selected instruments when the instruments are rendered English language independent through use of an interpreter in the children's dominant languages, and adjustments are made for the age in months of the children.

The subjects included in this study were 4 and 5 year old students who enrolled in kindergarten in the public schools of Denver, Colorado during the school year of 1982-83, and who were individually tested in their homes during the month of August 1982 just prior to their kindergarten entrance. ES Anglo, NES Mexican, and NES Vietnamese students were randomly selected, and through random assignment of children stratified by sex, 10 boys and 10 girls were assigned to each ethnic group making a total of 20 students in each ethnic group and a grand total of 60 students for the study. All students were members of families classified at lower socioeconomic levels.

After parental permission was obtained in writing, three predictor tests of academic readiness were administered to the subjects of this study (in their homes during the month preceding school entry) by the researcher/teacher, and interpreters who were native speaking persons from the same cultural population as the children. These predictor tests were the Cooperative Preschool Inventory (CPSI), the Columbia Mental Maturity Scale (CMMS), and the Michigan State University Puzzle Box (MSU). The criterion test, the Metropolitan Readiness Test (MRT) (Level One) was administered to the students at the same point in time.

The raw data were entered into a standard schema for computing: (1) interrelationships among predictor tests and criterion test for all groups, (2) multiple correlations, (3) multiple regression equations, (4) analysis of covariance, and (5) chi-square for each ethnically diverse group.

The Pearson correlation coefficients of the predictor variables with the criterion test were computed for the total group, the three ethnically diverse groups, and for boys and girls. Although age in months generally had a positive relationship with the criterion variable in all groups, these correlations were not significant at the .05 level. The tests for general knowledge (CPSI), intelligence (CMMS), and persistence (MSU) had positive relationships with the criterion variable of academic readiness (MRT) in all groups at the .05 level with the exception of the relationship of general knowledge (CPSI) with academic readiness (MRT) for the NES Vietnamese students.

The multiple correlations of the predictor variables with the criterion variable for each ethnically diverse group showed a range from .52 for the NES Mexican students to .72 for the NES Vietnamese students. The multiple correlation that yielded the highest prediction was for the NES Vietnamese students. The coefficient of multiple determination, which accounted for the percentage of variance in the academic readiness scores due to the combination of predictor variables, was also highest for the NES Vietnamese students with 52% of the variance accounted for, as compared to 49% for the ES Anglo, and 27% for the NES Mexican students.

For each ethnically diverse group, a level of .05 was set as the prescribed significance to be met in order to be included in the multiple regression equations. The Michigan State University Puzzle Box (MSU), test of persistence, was the only test included in the multiple regression equation for both the ES Anglo and the NES Mexican students. The Columbia Mental Maturity Scale (CMMS), the test of intelligence, was the only test included in the multiple regression equation for NES Vietnamese students.

The analysis of covariance with a block on sex and age in months as the covariate was used to determine significant differences among the means of the test predictor and criterion variables at the .05 level of significance. The differences among means of the test variables of the study were insignificant for all ethnically diverse groups and for boys and girls.

A chi-square cross tabulation of persistence to completion by ethnicity was computed, and the results showed that there was a significant difference among the ethnically diverse groups on this variable. A percentage tabulation showed this difference to be between the NES Vietnamese and other ethnic groups of students.

## Conclusions

The data yielded information from which the following conclusions were drawn:

1. All, but one (Age), of the test independent predictors employed in this study showed a significant relationship with academic

implying the myriad of factors which influence academic readiness in ethnically diverse 4 and 5 year old students.

2. The finding that all the predictor tests had a significant positive relationship with each other supports the conclusion that the factors which influence academic readiness in ethnically diverse 4 and 5 year old students are complex and interrelated.

3. The lack of a significant correlation between age in months and academic readiness may be influenced by the age range of the study (from 56 months to 71 months in age) as well as the difficulties of accurately assessing exact ages in ethnically diverse students.

4. The one independent predictor, a test of general knowledge, which was not significant for the NES Vietnamese students implies that the Vietnamese perhaps had not been exposed to general knowledge as measured by this instrument due to their recent exposure to western society.

5. The finding of no significant differences among ethnically diverse groups on measures of general knowledge, intelligence, persistence, or academic readiness when tests were made English language independent through the use of interpreters implies that there is a need for reliable accurate assessment of NES ethnically diverse students on measures related to academic readiness at an early age to avoid misclassification of students.

6. The finding of a significant difference between NES Vietnamese and the other ethnically diverse students of the study on persistence to completion of the puzzle task, implies the need for further research on this variable among ethnically diverse groups,

and leads educators to suspect there are cultural differences between students even at the 4 to 5 year old levels.

## Implications of This Study

The stated age range of the children in the study was 16 months and it was ascertained that there were no significant differences in test results due to the ages of children. However, it should be noted that there is no accurate way to pinpoint the exact ages of the children tested due to the fact that many of them were displaced children with no traceable birth records on which to rely. It is a little recognized fact that many non-western cultures do not record such things as births in a systemized method as is done in the United States. This information underlines the necessity for statisticians not to rely heavily on birth data gathered in non-western societies.

The results of this study emphasize the importance of not grouping all NES-new immigrant children together for research purposes without differentiation of cultural background. For example, the NES Vietnamese in this study were extraordinarily adept at completing an assigned task, much more so than the Anglo or Mexican students. Cultural differences in test scores must be considered before pooling the data gathered in order to avoid erroneous conclusions.

During the testing procedure in this study with the child in his own home environment, it was apparent that there were differences in cultures, specifically the reinforcing of task persistent behavior by the Vietnamese parents. It was noted that the Anglo and Mexican parents did not actively hover around the testing situation nor did they display approving emotion when the children completed tasks, as did the Vietnamese parents. A point to consider was the obvious difference in cultures as to how they respected the teacher. At each Vietnamese child's home, a cool soft drink was always offered; in some homes they even offered to share precious food which the perceptive, empathetic Vietnamese teacher interpreter graciously declined. On the other hand, the polite Anglo and Mexican parents rarely offered libation or food, and at the child's completion of an assigned task they rarely showed exuberance, approbation, or demonstrative respect for the teacher.

Most educational research studies are conducted in the classroom; whereas data for this study was gathered in children's homes. Secure in their home environments, 4 and 5 year old NES children were tested in a relaxed atmosphere in which an interpreter from their own culture, verbalizing the questions in their own language, encouraged them to feel positive toward the testing situation. This method of gathering data probably led to more reliable results.

The finding of no significant differences among ethnically diverse children on tests of general knowledge, intelligence, persistence, or academic readiness when tests are made English language independent was established in this exploratory study. Therefore, it is important to note that the methods employed in data gathering during this study might be of significant importance to other researchers in achieving more accurate results when assessing young children.

## Recommendations

On the basis of the findings and conclusions of this study, the following recommendations appear justified.

1. Consideration should be given to the high interrelationship among the three predictor tests; although one test per ethnic group was marginally superior, the margin of superiority was small. Therefore, it is not possible to recommend different tests for ethnically diverse groups.

2. The relative lack of variation among ethnically diverse low SES groups when tested in their native languages points to the need for school based action programs which include translators present during testing.

3. Experimentation should be encouraged with a similar population, using other predictor tests not included in the study to ascertain if the multiple correlation would be significantly different from that obtained in this study.

4. Experimentation should be encouraged with different ethnically diverse groups not in this study, using the predictor tests included in this study to ascertain if the multiple correlation would be significantly different from that obtained in this study.

5. Experimentation should be encouraged with different ethnically diverse groups not in this study, using predictor tests not included in this study to ascertain if the multiple correlation would be significantly different from that obtained in this study.

6. Research studies should be encouraged to analyze different patterns of child rearing among cultures that might contribute to variations in task persistence to completion behaviors of ethnically diverse students.

This study was limited in duration and size of sample; it was a short term exploratory study, using small numbers and lasting only one month. However, the results show that a more accurate assessment can be made using the child's dominant language during the testing procedures rather than using only the standard English language of the schools for these purposes. This more accurate assessment at the beginnings of the kindergarten school year would lead to a more reliable prediction of academic readiness for ethnically diverse children, and prevent misidentification of these children as educationally handicapped at an early age. In addition, this study points to the necessity of understanding child rearing practices in various cultures as they relate to academic readiness; the necessity of recognizing the individuality of ethnic groups when conducting research; the necessity of questioning the concept of chronological age of children from non-western societies; and the necessity of choosing varied, appropriate instruments when gathering data from ethnically diverse groups of young children. It appears that children from diverse ethnic groups do not manifest differences in intellectual ability, but their cultural conditioning and English language proficiency may affect their performance on tests.

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# APPENDIX A

## PARENTAL PERMISSION FORMS

UNIVERSITY OF DENVER
An Independent University
University Park, Denver, Colorado 80208

School of Education JULY 20, 1982

Dear Parents:

Your child has been selected to participate in a research study, supervised by the University of Denver, to develop a system to predict academic readiness in four and five year old ethnically diverse children.

A total of 75 children from the Denver Public Schools Early Childhood Program have been chosen to participate in this study. The research will include English speaking and non-English speaking children.

The selected children will be examined using their home language on tests of general knowledge, intelligence, persistence and academic readiness. An individual child will not be personally identified in any of the reports of the research findings. If you wish more information concerning the tests, please contact Mrs. Marjorie Milan at 233-0672.

We feel this study will benefit the children of the Denver Public Schools and would like your participation. The students will enjoy taking the tests. Please indicate that you give your permission for your child to participate by signing below. If after signing this form you do not wish your child to participate in the study you may withdraw your permission by contacting Mrs. Milan at 233-0672.

Sincerely,

Marjorie Milan

Mrs. Marjorie Milan
Researcher, Teacher
Denver Public Schools

---

Please indicate your cooperation by signing below. Thank you.

________________________
Child's name

________________________
Parent's Signature Date

___Yes, I do want my child to participate.

THE UNIVERSITY OF DENVER IS AN AFFIRMATIVE ACTION INSTITUTION

Universidad de Denver
Una Universidad Independiente
University Park, Denver, Colorado 80208

Escuela de Educación

Julio 20, 1982

Estimados Padres:

Su hijo/a ha sido seleccionado para participar en un estudio de investigación, supervisado por la Universidad de Denver, para desarrollar un sistema que pronostique una buena disposición académica en niños de cuatro a cinco años de edad de diverso origen étnico.

Un total de 75 niños del Programa de Primera Infancia de las Escuelas Públicas de Denver, han sido escogidos para participar en este estudio. La investigación incluirá niños de habla inglesa y no-inglesa.

Los niños seleccionados serán examinados usando su propio idioma en exámenes de conocimiento general, inteligencia, persistencia y buena disposición académica. Un niño individual no será identificado en ninguno de los informes de los resultados de la investigación. Si Ud. desea mayor información acerca de los exámenes, por favor, póngase en contacto con la Sra. Marjorie Milan llamando al teléfono 233-0672.

Sentimos que este estudio beneficiará a los niños de las Escuelas Públicas de Denver y desearíamos su participación. Los estudiantes disfrutarán tomando los exámenes. Por favor indique que Ud. dá su permiso para que su hijo/a participe firmando en la parte inferior. Si después de firmar este formulario Ud. no desea que su niño participe en el estudio, Ud. puede retirar su permiso poniéndose en contacto con la Sra. Milán llamando al teléfono 233-0672.

Sinceramente,

Marjorie Milan

Mrs. Marjorie Milan
Profesora de Investigación
Escuelas Públicas de Denver

---

Por favor indique su cooperación firmando a continuación. Gracias.

______________________________
Nombre del niño/a

______________________________
Firma de los padres Fecha

___Si, deseo que mi hijo/a participe.

**VIỆN ĐẠI HỌC DENVER**

**Một Viện Đại Học Tự Lập**

**University Park, Denver, Colorado 80208**

Trường Giáo Dục

Ngày 20 tháng 7 năm 1982

Kính thưa Quý Phụ Huynh,

Con em của Quý Vị đã được chọn để tham dự vào một chương trình khảo cứu, do Viện Đại Học Denver kiểm soát, hầu triển-khai một phương pháp để dự kiến sự hiếu học của các em tuổi từ bốn hay năm khác nhau.

Trong chương trình thiếu nhi của Khu Học Chánh Denver tổng số gồm 75 em được lựa để tham gia cuộc khảo cứu này. Cuộc khảo cứu sẽ bao gồm các em nói tiếng Anh và các em không nói tiếng Anh.

Các em được chọn sẽ được trắc-nghiệm bằng ngôn ngữ bản xứ về kiến-thức tổng quát, trí thông-minh, sức kiên-trì và lòng hiếu-học. Các em sẽ không bị nêu ra riêng biệt từng cá nhân để viết vào báo-cáo về sự khám phá trong khảo cứu. Nếu Quý Vị muốn biết thêm chi tiết về cuộc trắc nghiệm, xin vui lòng tiếp xúc với Bà Marjorie Milan bằng số điện thoại 233-0672.

Chúng tôi nhận thấy cuộc khảo cứu này sẽ có lợi cho các em của Khu Học Chánh Denver và rất mong sự tham gia của Quý Vị. Các học sinh chắc sẽ cảm thấy thích thú khi dự cuộc trắc nghiệm. Xin Quý Vị hãy ghi tên cho con em mình được phép tham dự bằng cách ký tên dưới đây. Sau khi đã ký tên trên mẫu này nhưng khi Quý Vị không muốn con em tham dự cuộc khảo-cứu, Quý Vị có thể rút lại giấy cho phép bằng cách tiếp xúc với Bà Milan với số điện thoại 233-0672.

Trân trọng,

Marjorie Milan

Bà Marjorie Milan
Người Khảo Cứu, Giáo Sư
Khu Học Chánh Denver

---

Xin thể hiện sự hợp tác bằng cách ký tên dưới đây. Cám ơn.

________________________
Tên đứa bé

________________________
Chữ ký của Phụ Huynh

_____Có, tôi bằng lòng con/em tôi tham dự.

(Vietnamese Version)

# APPENDIX B

## QUANTITATIVE INFORMATION FOR THE STATISTICAL ANALYSES

### Raw Data

| Case No. | MRT | CPI | CMMS | MSU Persist | Age | Ethnic | Sex | Completion |
|---|---|---|---|---|---|---|---|---|
| 1 | 57 | 58 | 114 | 11 | 67 | 1 | 0 | 0 |
| 2 | 49 | 62 | 103 | 7 | 67 | 1 | 0 | 0 |
| 3 | 61 | 60 | 108 | 14 | 66 | 1 | 0 | 0 |
| 4 | 22 | 49 | 90 | 4 | 63 | 1 | 0 | 0 |
| 5 | 59 | 61 | 97 | 15 | 61 | 1 | 0 | 0 |
| 6 | 54 | 53 | 112 | 12 | 59 | 1 | 0 | 0 |
| 7 | 57 | 57 | 97 | 12 | 61 | 1 | 0 | 0 |
| 8 | 33 | 59 | 89 | 9 | 62 | 1 | 0 | 0 |
| 9 | 44 | 61 | 112 | 15 | 61 | 1 | 0 | 1 |
| 10 | 51 | 55 | 94 | 6 | 68 | 1 | 0 | 0 |
| 11 | 57 | 62 | 126 | 15 | 67 | 1 | 1 | 0 |
| 12 | 51 | 64 | 116 | 15 | 67 | 1 | 1 | 0 |
| 13 | 48 | 53 | 116 | 10 | 68 | 1 | 1 | 0 |
| 14 | 34 | 41 | 88 | 6 | 68 | 1 | 1 | 0 |
| 15 | 40 | 47 | 92 | 5 | 62 | 1 | 1 | 0 |
| 16 | 44 | 49 | 103 | 9 | 69 | 1 | 1 | 0 |
| 17 | 47 | 43 | 87 | 8 | 64 | 1 | 1 | 0 |
| 18 | 44 | 47 | 94 | 7 | 68 | 1 | 1 | 0 |
| 19 | 53 | 54 | 99 | 10 | 71 | 1 | 1 | 0 |
| 20 | 56 | 60 | 111 | 14 | 70 | 1 | 1 | 0 |
| 21 | 39 | 46 | 104 | 15 | 68 | 2 | 0 | 1 |
| 22 | 32 | 54 | 99 | 13 | 69 | 2 | 0 | 0 |
| 23 | 25 | 45 | 102 | 6 | 65 | 2 | 0 | 0 |
| 24 | 30 | 46 | 95 | 10 | 61 | 2 | 0 | 0 |
| 25 | 30 | 41 | 92 | 7 | 63 | 2 | 0 | 0 |
| 26 | 43 | 61 | 103 | 12 | 69 | 2 | 0 | 0 |
| 27 | 36 | 49 | 91 | 6 | 63 | 2 | 0 | 0 |
| 28 | 35 | 47 | 84 | 10 | 59 | 2 | 0 | 0 |
| 29 | 30 | 52 | 110 | 6 | 63 | 2 | 0 | 0 |
| 30 | 50 | 57 | 124 | 14 | 69 | 2 | 0 | 0 |

Raw Data (continued)

| Case No. | MRT | CPI | CMMS | MSU Persist | Age | Ethnic | Sex | Completion |
|---|---|---|---|---|---|---|---|---|
| 31 | 33 | 54 | 94 | 8 | 69 | 2 | 1 | 0 |
| 32 | 47 | 55 | 111 | 10 | 65 | 2 | 1 | 0 |
| 33 | 52 | 43 | 87 | 7 | 68 | 2 | 1 | 0 |
| 34 | 39 | 56 | 108 | 13 | 62 | 2 | 1 | 0 |
| 35 | 64 | 50 | 120 | 15 | 60 | 2 | 1 | 0 |
| 36 | 50 | 46 | 99 | 8 | 69 | 2 | 1 | 0 |
| 37 | 51 | 60 | 113 | 15 | 64 | 2 | 1 | 1 |
| 38 | 47 | 52 | 100 | 8 | 65 | 2 | 1 | 0 |
| 39 | 22 | 36 | 94 | 5 | 62 | 2 | 1 | 0 |
| 40 | 35 | 44 | 102 | 12 | 64 | 2 | 1 | 0 |
| 41 | 33 | 43 | 94 | 8 | 68 | 3 | 0 | 0 |
| 42 | 26 | 58 | 92 | 15 | 63 | 3 | 0 | 1 |
| 43 | 42 | 52 | 101 | 7 | 62 | 3 | 0 | 0 |
| 44 | 46 | 48 | 108 | 15 | 62 | 3 | 0 | 1 |
| 45 | 61 | 55 | 118 | 15 | 68 | 3 | 0 | 1 |
| 46 | 50 | 54 | 125 | 15 | 64 | 3 | 0 | 1 |
| 47 | 48 | 48 | 104 | 15 | 61 | 3 | 0 | 1 |
| 48 | 23 | 46 | 95 | 7 | 64 | 3 | 0 | 0 |
| 49 | 30 | 38 | 84 | 6 | 69 | 3 | 0 | 0 |
| 50 | 58 | 49 | 109 | 8 | 66 | 3 | 0 | 0 |
| 51 | 33 | 63 | 90 | 15 | 62 | 3 | 1 | 1 |
| 52 | 57 | 51 | 124 | 15 | 70 | 3 | 1 | 1 |
| 53 | 47 | 55 | 104 | 15 | 63 | 3 | 1 | 1 |
| 54 | 57 | 56 | 95 | 15 | 69 | 3 | 1 | 1 |
| 55 | 61 | 56 | 112 | 9 | 56 | 3 | 1 | 0 |
| 56 | 47 | 59 | 103 | 15 | 66 | 3 | 1 | 1 |
| 57 | 53 | 58 | 101 | 15 | 60 | 3 | 1 | 0 |
| 58 | 42 | 51 | 110 | 9 | 60 | 3 | 1 | 0 |
| 59 | 35 | 33 | 85 | 3 | 63 | 3 | 1 | 0 |
| 60 | 36 | 46 | 94 | 7 | 60 | 3 | 1 | 0 |

# APPENDIX C

## EXAMPLES OF THE USE OF MULTIPLE REGRESSION EQUATIONS FOR ETHNICALLY DIVERSE GROUPS

Examples of the Use of Multiple Regression Equation
for English Speaking Anglo Students

| Item | Subject #2 | Subject #5 | Subject #12 |
|---|---|---|---|
| MSU Persistence Test | 7 | 15 | 15 |
| 1.896579 x MSU Score | 13.276053 | 28.448685 | 28.448685 |
| Constant | 28.70490 | 28.70490 | 28.70490 |
| Predicted MRT Score* | 41.98 | 57.15 | 57.15 |
| Actual MRT Score | 49 | 59 | 51 |

*Predicted MRT Score = 28.70490 + 1.896579 (MSU)

Examples of the Use of Multiple Regression Equation for Non-English Speaking Mexican Students

| Item | Subject<br>#21 | <br>#37 | <br>#39 |
|---|---|---|---|
| MSU Persistence Test | 15 | 15 | 5 |
| 1.631818 x MSU Score | 24.47727 | 24.47727 | 8.15909 |
| Constant | 23.18182 | 23.18182 | 23.18182 |
| Predicted MSU Score* | 47.66 | 47.66 | 31.34 |
| Actual MRT Score | 39 | 51 | 22 |

*Predicted MRT Score = 23.18182 + 1.631818 (MSU)

Examples of the Use of Multiple Regression Equation
for Non-English Speaking Vietnamese Students

| Item | Subject<br>#45 | <br>#49 | <br>#54 |
|---|---|---|---|
| CMMS Intelligence Test | 118 | 84 | 95 |
| 0.7256210 x CMMS Score | 85.623278 | 60.952164 | 68.93395 |
| Constant | -30.05359 | -30.05359 | -30.05359 |
| Predicted MRT Score* | 55.57 | 30.90 | 38.88 |
| Actual MRT Score | 61 | 30 | 57 |

*Predicted MRT Score = -30.05359 + 0.7256210 (CMMS)